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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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A Defence of Chemical Warfare

No one can read the article on "Chemical Warfare" which Sir William Pope contributes to this issue of THE CHEMICAL AGE without being impressed by the candour with which the distinguished author discloses his point of view, and the clearness and force with which his case is stated. With a cool and sure hand he disentangles the principles involved from the conventions which obscure them, and by progressive steps he develops an argument in favour of the recognition of chemical warfare which requires to be, but has not yet been, answered. It is not our intention to attempt to restate a case already stated by a master of the subject. Some general reflexions may, however, be offered.

It is, perhaps, hardly necessary to say that Sir William Pope is not an advocate of war. That is an ethical question which does not arise here. His case appears to be that, so long as war is recognised, the employment of gas is just as defensible as that of any other weapon, and that one need be no more ashamed of it than of the use of the barbarous bayonet on land or of battleships and submarines on sea. More than this, he claims that poison gas is far less fatal and far less cruel than any other instrument of war. When there is an end of all war, then, indeed, poison gas, with the Navy and the Army and the Air Force, must go. Until that time, military science has to be cultivated, and since poison gas comes within its scope it has to be recognised too, as just as legitimate or illegitimate as any other method of killing or disabling the enemy. To accept as a matter of course all the other weapons of war, and to exclaim in horror at the use of chemical agencies, is something very like cant. It is this cant that Sir William Pope would get rid of, so that preparations for chemical warfare may be as openly pursued as the preparations necessary in any other branch of the fighting service.

The prejudice against chemical warfare arises really from the fact that it is new. Sir William's historical treatment of this argument is equally entertaining and effective. Nearly every new device, in its turn, has been denounced as inhuman—as, indeed, all war is. But our contributor takes pains to show, by various comparisons, that the employment of gases is less rather than more inhuman than other piously accepted methods. "It will be a simple task," he tells us, "to devise high explosive, a most honourable weapon, which will evolve large amounts of this excessively poisonous gas [carbon monoxide], against which all known protective masks are useless. Further, no reason exists why chemical shell should not be made which does not kill but produces local anæsthesia, causes violent sneezing for a few hours, or leads to some other form of physiological intoxication which may prove of great military value."

The most striking part of the article, however, is that in which Sir William Pope shows the almost trifling consequences of the use of gas compared with those following the application to war of what he calls preventive medicine. In other words, medical science has been applied with such success to military operations as enormously to enlarge the scale of war and thus to magnify its destructive effects. Superficially medical science serves a humane purpose in protecting armies from disease. Fundamentally its effect is the opposite, since it enables (one might almost say) millions to engage in war where only thousands could formerly be employed. Moreover, the concentrated attention on the health and sanitation of huge armies, to keep them fit as fighting machines, deprives the civilian population correspondingly of the benefits of preventive medicine, and is responsible indirectly, though not less surely, for another and an immensely large class of casualties.

This is a new and effective argument, of which little or nothing has yet been heard, and Sir William Pope wields it with his accustomed skill against the medical

men who denounce the employment of the chemist, while they themselves are employed—without a pang of conscience—to make war possible on an ever-expanding scale. The case he presents is one that cannot be ignored. It is, in effect, a demand that chemical warfare shall be recognised on exactly the same grounds that other forms of warfare are recognised, and that the Government should no more be ashamed of utilising the services of chemists to this end than of employing any other profession or class for naval, military, or air service.

Dr. E. B. Maxted on Hydrogen

ACTIVITY in connexion with hydrogen plant has, of course, been severely restricted since the conclusion of the war; but, apart from its use in aeronautical work, this gas is likely to assume an increasing importance in the industrial world. As in the case of so many other chemical products it was the exigencies of war which demanded a more thorough study of the available hydrogen processes, and in the course of this work new ideas arose and innumerable improvements were effected. Development has been particularly rapid, but it is still a matter for question as to which of the four main industrial processes is likely to show the most favourable results, although so far as this country is concerned one might dismiss the electrolytic systems owing to their dependence upon cheap water power. The remaining three processes all come down to water gas as the essential starting product, so that, given an ordinary mixture of hydrogen and carbon monoxide as yielded by the interaction of coke and steam, the problem resolves itself into the question how the foreign constituents may be most readily and economically eliminated. The most obvious method is that of effecting separation by reducing the temperature of the mixture to such a point that all the unwanted gases are liquefied, leaving a hydrogen of sufficient purity for use in catalytic work.

Two factors, however, have to be taken into account in hydrogen manufacture, namely, purity of the product obtained, and the cost of obtaining it. It is, perhaps, the difficulty of combining these two requirements in a single process that has proved the main stumbling block, for whereas it is possible to obtain a high standard of purity at a high cost, the cheap processes have, on the other hand, left something to be desired in the way of quality. There would appear to be little question that from the economic standpoint the catalytic processes, whereby carbon monoxide is replaced by hydrogen by reaction effected between the former and steam, offers considerable scope, and we may recall the opinion given by one of our contributors some twelve months ago that by such processes the cost per unit volume of gas should be half of that obtaining with the iron contact system. The objection to the more simplified catalytic process, however, is that final purification is likely to be a little complicated owing to the difficulty of obtaining entire immunity from carbon monoxide.

In determining upon the type of plant to be installed very much must, of course, depend upon the use to which the hydrogen is to be put, but for the majority of industrial purposes a high degree of freedom from impurities is demanded. It is for this reason that Dr. Maxted predicts some considerable future for the cyclic water gas process in which the replacement of carbon monoxide by hydrogen is carried out in two separate phases. As ordinarily conducted, the cyclic process gives rise to a small proportion of carbon monoxide, which results, during the steaming period, from secondary reaction of steam with the small quantity of carbon deposited during the reducing period. The difficulty to be surmounted is the prevention of the decomposition of carbon monoxide, and hence the deposition of carbon, and Dr. Maxted shows that the trouble may be overcome by the simple expedient of varying the composition of the gas used for reduction. Accordingly, in place of ordinary water gas of the usual high temperature variety, a low temperature water gas is utilised, with the result that the carbon dioxide content of the gas is increased. Carbon dioxide is, therefore, maintained in quantities in excess of the equilibrium percentage in the reversible reaction $2CO \rightleftarrows CO_2 + C$, and in order to permit of this condition being satisfied in practice the only alteration required is a somewhat larger producer.

A Traders' Concordat

THE joint meeting of the Chemical and Dyestuff Traders' Association and the British Chemical Trade Association held on Thursday week to consider the question of amalgamation reached no final conclusion; but, in spite of certain hostile influences, it served one useful purpose. It brought out the fact that on all fundamental points the members of both associations are agreed. Firstly, they agree that one representative association is desirable; secondly, they agree that it should be British in fact as well as in name; thirdly, they hold that it should be confined to the genuine merchant class trading in chemicals and dyestuffs. The statement circulated before the meeting that the associations had failed to agree on the vital points is thus shown to have been exactly the reverse of the fact. It can only be explained on the ground that its authors lack the normal sense of proportion or suffer from that common form of mental astigmatism which prevents the sufferer from seeing the wood for the trees. The foundation principles being now accepted as common ground, what remains to be settled are the usual domestic details which arise in such cases, and which sensible people compose quietly among themselves.

This unification of policy marks a distinct step forward, and the Chemical and Dyestuff Traders' Association may regard it as a vindication of the position they took up on the formation of that body—namely, that the membership should be limited to merchants and to firms of British nationality and domicile. The British Chemical Trade Association have now accepted these principles quite frankly, and to that extent modified their original policy. That policy differed essentially from that of the other body on two points. It opened the membership to firms of other than British nationality. Of these, a certain proportion were identified with American interests. On this point THE CHEMICAL AGE has taken up a clear

position from the outset. In our first issue we warned the chemical industry of this country that Germany was not the only rival to be reckoned with, and that American competition would also have to be taken account of. No one desires that American interests should be excluded from this country, any more than American ships from our ports; but the question does arise whether the same rule—that they should sail under the Stars and Stripes—does not apply. Even where they are technically domiciled in this country, we imagine that British firms, whether large or small, are entirely in agreement that the policy of British organisations shall not be dominated by American interests or methods.

On the second point the case is equally clear. A merchants' organisation must consist of merchants. Here, again, the British Chemical Trade Association has accepted the principle that membership for the future must be confined to firms trading in chemicals or dyestuffs. It would seem, therefore, that the way is clear to an understanding which the trade generally desires, which would unite the merchant class of the entire country, and which would lead to the building up of a really national organisation. On such a basis merchants could claim the recognition which manufacturers and other classes have already secured, and take effective steps to safeguard their interests, now so seriously affected by legislation and departmental regulations. The only remaining difficulties are matters of detail, and these are of such a nature that a handful of sensible men selected from both sides should have no difficulty in disposing of them.

Nitrate Facts and Figures

THE overladen condition of the nitrate market and the forced selling at low prices which has recently taken place has already been referred to in these columns. To the information which we have given, however, must be added the facts submitted by Mr. Brodie James who makes the nitrate industry his particular study. In a pamphlet which he has recently published, Mr. James refers to the work of the Nitrate Association of Producers, and shows that the Association has been eminently successful up to now, a fact which shareholders will recognise within the next six months. Some twelve months ago Mr. James stated that the German producers of nitrate held the trump card so far as the Association of Producers was concerned, and that this was the correct view is shown by the fact that, after considerable negotiation and pressure, they were able to fix a sum of some £350,000 as the price of their entry into the combination. The latter now includes 97½ per cent. of the total productive capacity of Chili, the balance of 2½ per cent. being represented by American interests.

Unfortunately, the monetary crisis, which developed so acutely towards the end of last year, upset all calculations, so that while the Association has no difficulty in determining prices, it is quite a different matter to find buyers for a commodity the supply of which is, for the time being, greatly in excess of the purchasing power necessary for absorption. The recent severe fall in nitrate shares would seem to indicate that the situation has already been largely discounted; but a further drastic cut in production would appear to be the only means of reducing stocks to a reasonable level; and, to quote Mr. James, as the majority of producers will disclose handsome profits for 1920 and the first six months of 1921, they cannot altogether complain if their future balance sheets should be less favourable. Those interested in the financial and working details of the various nitrate undertakings will find a wealth of information in Mr. James's pamphlet entitled "Nitrate Facts and Figures."

New Acid Processes

IT is not our province to pronounce judgment on the new processes for the production of H, Gamma, and other acids discussed at a meeting of dyestuff manufacturers and users last Tuesday, but certainly the technical report and claims seemed to impress the experts present, and their views may be made known later. The process so far is a secret one, and though it is reported to be capable of being patented, those interested prefer to retain it as a secret, with adequate safeguards against its disclosure. The commercial proposition appears to be that a parent company should be formed, with a capital of about £25,000, not a huge sum if the claims are moderately well realised. With this aspect of the matter we have, of course, nothing to do, but so much has been heard of late of the failure of commercial interests to encourage chemical research in this country that we are glad to have succeeded in securing the attention of important British foreign concerns to the work and claims of a British chemist. There our function in such matters ends.

The Calendar

May 9	Royal Institution of Great Britain: Ordinary Meeting. 5 p.m.	Albemarle Street, Piccadilly, London
10	Institution of Petroleum Technologists: "Trinidad as a Field for the Study of the Origin of Petroleum," by P. Carmody. 5.30 p.m.	Royal Society of Arts John Street, Adelphi.
11	Royal Society of Arts: Meeting. 4.30 p.m.	John Street, Adelphi.
12	Institute of Chemistry: Liverpool Section	Liverpool.
13	Royal College of Science Union: Chemical Society: "Colour Photography on Paper," by J. J. Taylor	Royal College of Science, South Kensington, London.
19	Chemical Society: Ordinary Scientific Meeting and Informal Meeting. 8 p.m.	Burlington House, Piccadilly, London.
20	Royal Photographic Society of Great Britain: "The Choice of Lens," by A. C. Banfield	35, Russell Square, London, W.C.

Books Received

TABLES OF REFRACTIVE INDICES, OILS, FATS AND WAXES. Vol. II. Compiled by R. KANTHACK. Edited by J. N. GOLDSMITH. London: Adam Heilger, Ltd. Pp. 295. 25s. net.

A HANDBOOK OF LABORATORY GLASS-BLOWING. By Bernard D. Bolas. London; George Routledge & Sons, Ltd., pp. 106. 3s. 6d. net.

EMINENT CHEMISTS OF OUR TIME. By BENJAMIN HARROW, Ph.D. London: T. Fisher Unwin. Pp. 248. 9s.

The Case for Chemical Warfare

By Sir William J. Pope, K.B.E., F.R.S., D.Sc., LL.D.

In the following article Sir William J. Pope, Professor of Chemistry in the University of Cambridge and President of the Society of Chemical Industry, presents a reasoned statement of the case for the employment of chemical agents in warfare

THE recent war witnessed the introduction of many fresh military weapons; some of these were received with almost universal approval, whilst others provoked torrents of condemnation. The layman finds it difficult to understand this contrast. The apparently illogical manner in which praise or blame is distributed to any particular military novelty may well obscure the clear judgment just now so necessary to the selection of sound military methods for future use; some attempt should be made to discuss the whole question of innovation in military processes with a view to fixing essential principles and to removing obvious misunderstandings. Such a task as this calls for the co-operation of many minds of diverse types; in the present article a few considerations are advanced which bear intimately upon the whole subject.

The military mind always resents anything new. During the early part of the recent conflict I was repeatedly told by military men in responsible positions that the war was to be fought out on the same lines and by the same methods as applied during the Boer War; this fact should be remembered, because many gentlemen who held this conviction retain their official positions, and still exhibit signs of interest in terrestrial affairs when threatened by a demand for businesslike and progressive conduct. A gleam of hope is, however, discernible in that the military Trade Union has permitted dilution by the establishment on the service of many thoughtful men who achieved great things as progressive soldiers during the war.

Opposition to novelty by Government servants was as strong in the past as it is in the present. During the Crusades the use of the so-called Greek Fire was regarded as contrary to the laws of war, and even in quite modern times orders were given that soldiers captured in possession of rifled guns were to be shot out of hand. Four hundred years ago Ariosto explained in "Orlando Furioso" how, in Arthurian times, the fiend presented firearms to the hero, Roland, who was certainly in need of aid. Scorning this unchivalrous device, Roland threw it into the sea, whence it was fished up centuries later by the Germans, perfected by their abominable cunning, and used against mankind. Official conservatism was emphasised by the Church from the moment when Christianity secured political power; the second Lateran Council launched a threat of excommunication against those who used the arbalest, the machine for throwing big stones, against Christian troops. The permanent official parasite makes an abiding home in the blankets, and he and his kind, unlike Mark Twain's friends, always combine to resist the intrusion of a higher animal and to paralyse all effective movement. The permanent official will never lead; his future lies behind him, and ended when he took up his appointment. No hope of an enlightened policy concerning military methods can be descried but in an instructed public opinion translated into action by responsible political and military leaders.

Let us enumerate a few of the new military weapons forged during the last war, and consider the various ways in which these have appealed to the public imagination. Aeroplane warfare was entirely novel, and, despite official apathy, became a powerful and reputable instrument of war without much public protest. Poison gas warfare was new, but not entirely novel, because it was seriously proposed by the late Lord Playfair at the outset of the Crimean War. The autobiography of this eminent statesman and chemist shows that he understood the possibilities of chemical warfare, and regarded it as a very humane weapon. Thirdly, preventive medicine made, in 1914, its first serious appearance as an offensive arm; this subject is further discussed below. Many other novel developments in military methods, of course, emerged, but for our present purpose the above will suffice. Aeroplane warfare excited public acclamation; chemical warfare aroused universal execration; preventive medicine was welcomed as an entirely benevolent contribution of science towards the amelioration of suffering.

These diverse popular verdicts call for explanation; they can only be reconciled on the basis of some theory of warfare. Such a theory seems now capable of being stated in vague outline. War is very generally regarded as the highest form of sport; the exhilaration of the pursuit is enhanced when the quarry has the power of hitting back and of perhaps killing the sportsman. Aeroplane warfare ministers to the sporting instinct by increasing the excitement. Chemical warfare, on the other hand, is regarded as a dirty weapon; the man who uses it would shoot foxes and net salmon. Preventive medicine acts like a super-efficient game-keeper; it preserves the game for the legitimate sportsman, and hence is held in esteem.

This rudimentary theory indicates why chemical warfare is generally execrated whilst the military use of preventive medicine is universally approved. Let us, however, consider the results achieved by the recent use of these two new weapons.

In April, 1915, the Germans launched chlorine gas against the Allied troops on the Yser, with results which caused the gravest consternation. It is certain, and this is very important, that if the enemy had possessed the courage of his convictions—putting over a really considerable supply of chlorine and following up resolutely the advantage gained—the war would have ended in 1915. Fortunately for the Allies, however, German primary and secondary education is in the main classical and so does not help its victims to discriminate between theory and mere practice; the German High Command failed to realise what a powerful weapon they had in their hands and so did not apply it effectively.

I am not attempting to excuse the use of poison gas by the Germans; there is only one reason, but that an all-powerful one, why they should not have used it, namely, that they had solemnly promised not to do so. No purpose would be served by discussing here the moral depravity and the executive incompetency of the German Staff in this connexion, but one result of their action is clear. Chemical warfare has been introduced and has come to stay; the British Cabinet, the League of Nations, and all other authorities are alike powerless to prevent its use in any future serious war.

Public opinion concerning the effects of chemical warfare has been very ill-informed; the grotesquely misrepresented case laid before the public is well stated in a letter which appeared in *The Times* of November 29, 1918, signed by eight of the most highly placed members of the British Medical profession, namely, the Presidents of the Royal Colleges of Physicians of London and Ireland, the Royal Colleges of Surgeons of England, Edinburgh, and Ireland, and the

Royal Faculty of Physicians and Surgeons of Glasgow, together with the Regius Professors of Physic in the Universities of Oxford and Cambridge. Several of the offices here concerned are Crown appointments, and this fact, together with the eminence of the signatories, gave great weight to the document. The letter urges that the Comity of Nations should prohibit chemical warfare and states that "the use of gas is self-condemned for the following reasons: It is an uncontrollable weapon, whose effects cannot be limited to combatants; it is an 'unclean' weapon, condemning its victims to death by long-drawn-out torture; it opens the door to infinite possibilities of causing suffering and death, for its further development may well lead to the devising of an agent which will blot out towns, and even nations."

The fact is that poison gas is far less fatal and far less cruel than any other instrument of war. One of the greatest discoveries made by the Germans was that "mustard gas" is a more efficient agent than any previously employed in chemical warfare for causing casualties; the introduction of this material led to an appalling lengthening of the casualty lists, and the fact that the French, Americans, and British had in sight an overwhelming production of this formidable substance was a large factor in determining the Armistice. Amongst the "mustard gas" casualties the deaths were less than two per cent., and when death did not ensue complete recovery generally ultimately resulted; it is unnecessary to dwell upon this merciful result in its contrast with the proportion of deaths among the casualties from projectiles and with the numbers of maimed, crippled and shell-shocked we see around us every day. Other materials of chemical warfare in use at the Armistice do not kill at all; they produce casualties which, after six weeks in hospital, are discharged practically without permanent hurt.

We may pass over the implied suggestions in the letter that the ordinary instruments of war do not affect non-combatants, that the "unclean" weapon is the only one which condemns its victims to death by long-drawn-out torture, and that chemical warfare should be abolished in that, unlike other agents, it is capable of improvement. Most people know that great numbers of non-combatants were killed by high explosive shell; all who have watched the casualties passing from the front to the dressing stations recognise that projectile wounds are far more ghastly than the lesions set up by chlorine, and those who have seen Verdun and Ypres know what high explosive has done already towards the blotting-out of towns. In order to focus attention upon the argument now being developed it may be noted that, although accurate statistics are not immediately available, the gas casualties in the recent war numbered several hundred thousands.

Let us turn from this offensive weapon, which had a casualty-producing power of the comparatively small order just remarked, to that of preventive medicine, which was first employed effectively during the recent war. Every great soldier has realised that an army is limited in size by the difficulty of keeping it free from epidemic and communicable disease; previously this factor pinned the army dimension down to a unit of 100,000 men. When the resources of preventive medicine were properly applied the unit dimension became a million men. Preventive medicine made it possible to maintain 20,000,000 men under arms and abnormally free from disease, and so provided greater scope for the killing activities of the other military weapons; a competent observer gives 15,000,000 as the number of combatants killed in warfare between 1914 and 1918, and nine-tenths of this achievement is due to preventive medicine. Further, the keeping of these vast armies in health, with its accompanying disorganisation of civilian activities, led to the dissemination of epidemic disease among non-combatants in all quarters of the globe. The civilian mortality from the mysterious war form of influenza alone amounted to scores of millions; this death-roll lies at the door of preventive medicine. We see, at the present moment, large tracts of Europe and Asia famine-stricken with a mortality of thousands per day, as the direct result of the efficiency of preventive medicine in keeping the whole man-power of a great part of the world under arms for so long a period; this is, again, the responsibility of the military medical services. In fact, for each soldier kept in the field by the army medical services, 10 or 20 non-combatants died, and hosts more will die, many by "long drawn-out torture."

In this article I am endeavouring to establish some sense of proportion; whilst the surprise effects of chemical warfare aroused anger as being contrary to military tradition, they were minute compared with those of preventive medicine. The former killed its thousands, whilst the latter slew its millions and is still reaping the harvest. A perusal of *The Times*' letter in the light of the above facts will show that a far more powerful appeal to the comity of nations would have been framed if the words "lethal gases," "gas," "chemical agencies" and "gas warfare" had been replaced throughout by the expression "preventive medicine." There is, however, a further indictment against the letter.

The eight leaders of the medical profession referred to above are well aware that the military medical services, wielded as an offensive arm with such appalling consequences by their younger and still active colleagues, have brought infinitely more suffering upon non-combatants and neutrals than has chemical warfare or any other weapon; why did they address so misleading a letter to the public? It is charitable to suppose that they did not sit in conclave, discuss the bearings of the various appliances of modern warfare, and then draw up and sign this grave appeal for the abolition of chemical warfare; the letter bears internal evidence that its signatories had nothing to do with its compilation but merely signed it unreflectingly at the suggestion of some crazy propagandist.

In December last the Executive Committee of the National Peace Council, in a resolution, noted "with profound regret that the British Government, as suggested by the Dyestuffs Bill and shown by the War Office appointment of a Research Committee, are contemplating preparations for the next war involving the employment of poison gas and all the latest possibilities of chemical discovery. It protests against this prostitution of science, and regards it as calculated to extend, perpetuate, and intensify the horrors of international strife." Here, as in the medical letter, may be detected the characteristic turn of phrase which marks the trail of the professional propagandist.

The influence of this publicity campaign is quite considerable. At the meeting of the International Red Cross Societies held at Geneva on April 5, 1921, it was decided to urge all Governments to sign an agreement, in addition to the Hague Convention, for: (1) The complete prohibition of the use of poison gas in warfare . . ." and, in the House of Commons a few months ago, the Parliamentary Secretary to the War Office excused Government activity in connexion with poison gas research, offensive and defensive, in terms of almost abject apology.

At the present time every aspect of national defence is under consideration; the enormous problems associated with national security and national economy demand that the discussion shall be carried out openly and in such a manner that the public will realise the issues at stake and grasp at least the principles of the methods involved. In view of the magnitude of the interests which arise we are

justified in asking the leaders of the medical profession to lay before the public the reasons which led them, at a moment when chemical warfare had been to a large extent responsible for ending the war, to throw the weight of their combined authority into a grave appeal to our statesmen for the abolition of a very humane, although new, instrument of warfare. This request is a reasonable one, because the document referred to is the only presumably official and authoritative statement of the case as against chemical warfare which has appeared and has naturally furnished the text for many attacks upon this arm; apart from inherent absurdities, the letter errs, in my opinion, in assuming that any one form of warfare can be more bestial than another.

It is, of course, possible that a League of Nations may be able to limit armaments; the magnitude of the industrial operations which must collaborate in the production of big guns or battle ships would facilitate the detection of an infringement of any convention. New and more potent agents of chemical warfare can, however, be elaborated in obscure laboratories and kept in secret reserve against the day when mobilisation gives the signal for mass production; this process is, indeed, in active progress. A distinguished chemist, Brigadier-General Harold Hartley, has told us that during the enquiry into German methods for making "mustard gas" which followed the Armistice, one of the respondents asked—"Why are you worrying about this when you know perfectly well that this is not the gas we shall use in the next war?" The Americans, who came into the war at their own convenient time, encountered chemical warfare when it had become fully established, and were thus more impressed by its potentialities than the other Allies, who had more or less grown up with this new arm. Of the total American casualties, about 30 per cent. were due to gas, and of these about 90 per cent. arose from skin burns; of the gas casualties 3 to 4 per cent. died, and something like 95 per cent. made complete recoveries. These facts impressed our transatlantic cousins. They have established a Chemical Warfare Service on a peace footing with a personnel of about 1,600 men, and have budgeted for an annual expenditure of four and a half million dollars on research connected with the development of the new weapon; they recognise that immediately an authoritative definition of chemical warfare is subscribed to by the members of any analogue of the Hague Conference much of the inventive power of Christendom will be devoted to circumventing the convention. This task will be an easy one in view of the great variety of effects producible by chemical agencies. In the late war many cases occurred in which high explosive shell liberated sufficient carbon monoxide to kill, and it will be a simple task to devise high explosive, a most honourable weapon, which will evolve large amounts of this excessively poisonous gas, against which all known protective masks are useless. Further, no reason exists why chemical shell should not be made which does not kill but produces local anæsthesia, causes violent sneezing for a few hours, or leads to some other form of physiological intoxication which may prove of great military value.

The questions which arise in connexion with chemical warfare call for judgment by an educated public opinion, informed by scientific men and instructed by men of affairs. At the first use of chlorine in 1915 our prelates implored the Allies not to soil themselves by retaliating upon the Germans in kind; had these sonorous voices been heeded we should inevitably have lost the war. Our medical leaders, posing as possessed of absolute knowledge of fact, have demanded the abolition of chemical warfare; these are neither scientific men nor men of affairs. All medical injunctions have to be reviewed in the light of a weighty judgment by Louis Pasteur, one of the most sagacious intellects which science has ever had in its service:—

"Malheureusement les médecins se plaisent volontiers dans les généralisations anticipées. Beaucoup d'entre eux sont des hommes d'une rare distinction naturelle ou acquise, doués d'une intélligence vive, d'une parole élégante et facile; mais plus ils sont éminents, plus l'art les absorbe et moins ils ont de loisirs pour le travail d'investigation. Poussés, néanmoins, par la passion du savoir, propre aux esprits d'élite, et qu'entretiennent les relations de la haute société de plus en plus curieuse des choses de la Science, ils s'emparent avidement des théories faciles, spécieuses, d'autant plus générales et appropriées aux explications vagues qu'elles sont mal établies par les faits."

Democracy has provided us with a Government which is doubtless better than we deserve, and while we discuss our attitude towards the subject the Government has had to decide whether to refrain from or to persist in action concerning chemical warfare. It is satisfactory to know that our administrators are moving in accordance with the carefully framed resolutions which, after mature consideration and ample discussion, were sent to the Prime Minister and other members of the Cabinet by the British Association for the Advancement of Science a year and a half ago; these resolutions strongly advocated the formulation of definitely organised schemes for national research on all scientific questions relating to warfare, public health, food production and national commerce and industry. It is, however, interesting to note that this country is devoting far less effort and money than is America to the development of that military arm which, with the air service, will dominate all future wars; interesting because it would seem that the charlatan and the propagandist have screamed so loudly on the other side of the Atlantic that they stand revealed before the more thoughtful as a mere public nuisance. Here they are taken more seriously, and have certainly led us to pursue the study of chemical warfare with less ardour than has been shown elsewhere.

Notwithstanding limitations, we must conclude that our Government has done wisely in following the course pursued by other Governments, also potential members of that League of Nations which is to end all strife, and in deciding to prosecute the study of the modes in which chemical warfare can be best utilised in modern military operations.

Rock Phosphate

United States Production Declines

THE United States Geological Survey has just issued a bulletin on the phosphate rock production of the United States, which states that the quantity of this material marketed during 1919 amounted to 2,271,983 long tons. As compared with the production of the preceding year, this showed a decrease of approximately 9 per cent. The total quantity mined during the year was only 1,851,459 tons, a decrease in production of nearly 19 per cent. as compared with the preceding year.

Exports fell during the war to only about one-tenth of their pre-war volume, having declined from 1,300,000 tons in 1913 to only about 143,000 tons in 1918. The year 1919 showed some advance over the level for the preceding year, but its total was less than 380,000 tons. During 1920, on the other hand, exports rose to 1,069,012 tons, or nearly the level of the pre-war years. The market in Southern Europe, continues the report, must be relatively limited, because France and Spain have greatly increased their capacity for the manufacture of fertilisers from the rock, and ample supplies for the needs of these countries are being shipped from Tunis and Algeria.

A copy of the report may be seen by United Kingdom firms on application of the Enquiry Room of the Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W.1.

Early Chemistry in Oxford

By C. T. Kingzett, F.I.C., F.C.S.

A CENTURY ago there was but one small laboratory in Oxford where chemistry was taught, and that was in the old Ashmolean Museum, in which connexion it is of interest to refer to the inaugural address which was delivered by Dr. Thomas Beddoes upon his appointment as Professor of Chemistry, in succession to Dr. Kidd—a copy of which is in my possession. This was inscribed to Sir Humphrey Davy and printed under date of January 10, 1823, as a "Humble attempt to recommend the Science which derives from his discoveries the strongest interest as a tribute of respect to his genius as a philosopher."

In this address he expresses the opinion that it might be "safely asserted that a series of between 30 and 40 lectures, generally exceeding an hour in length, ought, if the lecturer makes a proper use of his time, to convey a sufficiently comprehensive view both of the principles of Chemistry and of its more important applications to satisfy the general student."

He expresses his obligation to Dr. Kidd, under whom he studied, urges the utility of the subject as a recommendation to its study, and reviews the history and progress of Chemical Science and its advantages. He laments the unfortunate prejudice which "seems to exist in certain minds which renders them lothe to believe that what they are told is of so much importance in the arts of life," "can also be efficacious as a method of cultivating the understanding, of expounding the higher powers of the mind."

He also makes reference to "the production of nitre on the walls of this very laboratory," and adds that "at present it is sufficient to state that in attempting to account for its existence" "we have only the alternative of supposing the metal calcium to be transmuted into potassium, or the latter to be, in this instance, generated out of the constituents of air and water."

After referring to the objections which may exist in the minds of some against the general prosecution of experimental Chemistry within a college by the junior members of the Society, he is happy to inform his audience that "a druggist in this city has at my request consented to keep in hand a constant stock of chemical re-agents, together with such apparatus as is most commonly wanted for experiments, so that I hope in these respects we shall in future be as well supplied as we could be in the Metropolis."

The address is followed by an appendix, being a reprint of the syllabus, drawn up for the use of his class, as follows :—

On the general principles of Chemistry—
1. Attraction.
2. Heat.

On the atmosphere and its constituents.

On water and its base.

On the agency of electricity in the production of chemical changes.

On meteorology in atmospheric phenomena.

On primary compounds attracted to the positive pole of the voltaic battery.

1. Acid containing oxygen.
   Carbonic acid, Nitric acid, Sulphuric acid, Phosphoric acid, Boracic acid } and their respective bases.
2. Acids not containing oxygen.
   Muriatic acid and its acidifying principle, chlorine.
   Other compounds containing chlorine.
   Fluoric acid and its acidifying principle.
   On iodine and its compounds.

On primary compounds attracted to the negative pole of the voltaic battery.

1. Alkalies and their bases
2. Earths and their bases
3. Ores and the metals they contain

} with the principal salts formed by their union with the preceding acids.

On compounds consisting of oxygen and two simple combustibles.

1. Prussic Acid, and its base, cyanogen
2. Oxalic acid
3. Gallic acid

} with the principal salts which they contribute to form.

4. Acetic acid, with the history of vinous fermentation, alcohol, &c.

On Vegetable Chemistry.
1. The chemical phenomena of vegetation.
2. The proximate principles of vegetables.

On Animal Chemistry.
1. On the influence of chemical agencies upon the function of animals.
2. On the proximate principles of animal matter.

I can well remember Dr. Daubeny, who was Professor of Botany and who followed in the wake of Dr. Beddoes as chemical professor, and it was only when Sir Benjamin Brodie was appointed Waynflete Professor of Chemistry, that tolerably equipped laboratories (in the University Museum) became available for students' use.

The Casting of Metals

Cooling of Aluminium

DEALING with the subject of "The Casting of Metals," at the Eleventh Annual May Lecture of the Institute of Metals on Wednesday, Professor Thomas Turner said the casting of metals dated back to early antiquity. Every great nation had produced statuary in bronze; and there was no reason to believe that the quality of the older material could not be equalled to-day, while the output had been enormously increased, and the percentage of "wasters" reduced. Among the physical properties which allowed metals to be cast was viscosity, which was very low at temperatures just above the melting point, and thus metals could be poured as freely as water. Surface tension in metals was high, and this prevented them from wetting and adhering to the mould.

The high coefficient of expansion of aluminium introduced a special difficulty, and lead to fracture during cooling unless proper precautions were taken. Gases in non-ferrous metals were not so important as with steel, and any metal or alloy which did not develop gas by reaction, or did not unduly segregate, could be cast in a satisfactory manner provided that a suitable temperature was employed, that the mould was properly designed and made, and that the metal was skimmed and poured in the right manner.

Pure metals or single substances, as a general rule, possessed the same density whether slowly or quickly cooled. Those alloys in which there was an interval between the liquidus and solidus solidified over a temperature range and often expanded when slowly cooled, as, for instance, when cast in sand.

Extensometer tests by Professor Turner and his students had shown the nature and extent of such expansions in a number of typical alloys. The results of such tests agreed with the density determinations, but the extensometer had the advantage of showing not merely the net result, but the sequence and amount of each volume change. In practice one of the chief causes of failure was pouring at too high or too low a temperature. Other causes included such troubles as imperfect or badly fixed cores, faults in moulding, cracks, mis-runs or run-outs, and breakage in handling. In foundry work generally, the losses from all causes probably reached quite 10 per cent. of the output. The scientific man might introduce new ideas or processes, and explain and remove difficulties, but in the end metal casting was an art, and depended upon the skill, attention and experience of the craftsman, who had acquired a knowledge which he might not be able to express in words, but which it was his desire to be able to impress upon the product which was the outcome of his labour.

At the annual meeting of the Yorkshire Indigo, Scarlet & Colour Dyers, Ltd., at Leeds, on April 29, A VOTE OF CONDOLENCE was passed with the chairman, Mr. Philip Marsden, on his bereavement by the death of his wife

New Acid Processes

Meeting of Dyestuff Makers and Users

On Tuesday at the rooms of the Society of Incorporated Accountants, London, a representative meeting of dyestuff manufacturers and users was held to hear reports on new processes by a British chemist (Mr. Gilbert Owen) for the production of H, Gamma, and other acids. Mr. H. Haydon presided, and among those present were Major V. Lefebure and Mr. C. T. de Mouilpied (representing the British Dyestuffs Corporation), Mr. F. A. Frost and Mr. E. H. Bolling (South Metropolitan Gas Co.), Mr. Graeme Thomas (Graesser-Monsanto Chemical Co.), Mr. G. M. Colbeck-Welch (Hickson & Partners), Mr. A. W. Ashe (Chas. Page & Co.), Mr. J. T. Standfast (Burt, Bolton & Heywood), Mr. E. Houghton Fry (Walter Waugh & Co.), Mr. A. S. Calder (Chance & Hunt), Mr. H. A. Blundell (R. W. Greeff & Co.), Mr. F. Stephens (National Dyes, Ltd.), Mr. J. V. Ross Sharpe (J. R. & W. R. Sharpe & Co.), Mr. S. W. Lane (Carina, Ltd.), Dr. H. Drake Law, Mr. Gilbert Owen (the inventor), Mr. Temple and Mr. Ellis (Temple, Gothard & Co.), and others. The notice convening the meeting was in the following terms :—

H, Gamma, Naphthionic and Dianisidine Series, and Other Coal Tar Intermediates.

Owing to the interest taken in the announcements appearing in The Chemical Age under date of the 29th January, 1921, and 26th March, 1921, and to the undoubted importance, both financial and technical, of these discoveries, we are instructed to inform you that a meeting will be held on Tuesday, the 3rd May, 1921, at 2.30 p.m., at the Society of Incorporated Accountants and Auditors, 50, Gresham Street, London, E.C. 2, and at which meeting your attendance is invited.

The Chairman's Speech

The Chairman, in opening the proceedings, said that the meeting had been called for the purpose of giving consideration to the manufacture of dye intermediates by a new process discovered by a British chemist. Those processes had the advantage that they not only produced much purer products, but at a greatly reduced cost. He would not attempt to describe the scientific value of the discovery beyond saying that several of the intermediates proposed to be dealt with were not manufactured in this country to-day to any extent, but would get down to the commercial question. They would see from the figures he would submit that with a comparatively modest outlay large profits might be earned, to say nothing of the fact that British supplies would be available where we were now dependent on imports.

It was his intention to deal in the first place with that essential intermediate of the cotton dyes, "H" acid. He chose this particular acid because they had been fortunate enough to secure a report on the same from a well-known dye and intermediate authority, Dr. H. Drake Law. In his report, Dr. Drake Law stated :—

"This process resembles the best German practice. This method of producing H Acid is an improvement on existing processes known in this country. The process is a good commercial proposition. The prospects are good, especially in view of the protection offered by the new bill."

It was proposed that a private limited liability company be formed with a capital of £25,000. Plant would absorb approximately £5,500 of this sum, leaving the remainder for working expenses. This plant would be capable of turning out 30 cwt. of 100 per cent. acid per day, at a total cost, including overhead charges, of 3s. per lb. This cost was made up as follows :—Raw material 2s. 1d. per lb., labour 5d. per lb.; add 3d. for depreciation of plant, and 3d. for overhead charges. The present market price of this commodity was 10s. per lb. Assuming they sold it at 6s. per lb. and only turned out an average of 15 cwt. per day, for 5 days a week, they would show an annual profit of £65,520. It was suggested that a parent company might be formed, and there was ample scope for subsidiary companies interested in particular products. The figures he had given as to cost of production had been confirmed by Dr. Drake Law in his report.

Dealing with the next intermediate, Gamma Acid, the figures and estimates with regard to this were the inventor's, but as the inventor was present he would be pleased to answer any questions. The cost of raw material per lb. was 5s. 6d., labour 4d., add 7d. for depreciation of plant, and 7d. for overhead charges. This gave a total all-in cost of 6s. 2d. per lb. The present market price was 20s. per lb. Supposing they sold this at 12s. 6d. per lb., with the same output as H. acid, there would be an annual profit of £138,320. This did not take into account the sale of R Salts, which is a by-product of Gamma Acid. They would see from this what an attractive proposition this was from an investor's point of view. He might point out that the plant used to manufacture H Acid would also be used to make Gamma Acid, and during any depression in this trade could be utilised to produce Cleves Acid, Schaeffer Acid, S Acid, R and G Salts and others.

The inventor, in addition, was prepared to give the company the right to manufacture the Dianisidine and Napthionic Series, to which his invention also applied, and which should prove equally as attracive as H and Gamma Acids. The inventor was so confident of success that he asked for nothing more than a commission on the net profits, being prepared to stake his own reward on the actual results.

Specialist's Report

A long technical report on the processes, prepared by Dr. Drake Law, was read, bearing out the inventor's claims. Both Dr. Law and Mr. Owen replied to questions, and it was stated that the H. Acid had been tested by a large firm of dyestuff manufacturers and had produced a satisfactory magenta, a very severe test. It was stated that the acids were produced by a secret process, and the economical production was the joint result of saving of labour and chemical methods. Adequate steps had been taken to safeguard the processes.

The representatives present appeared to be keenly interested in the subject, and it was arranged that those who desired them should be supplied with samples of the H Acid.

The meeting closed with a vote of thanks to the chairman, and it was understood that the representatives would report to their respective firms.

The Textile Institute

Co-operation with Chemical Societies

The Annual General Meeting of the Textile Institute was held at Manchester on April 27, Colonel F. R. McConnel presiding. The Eleventh Annual Report showed that the past year had witnessed quite substantial advances not only in regard to the strength of membership, but also in relation to the various activities of the Institute. With a view to the permanent improvement of the financial resources of the Institute a Foundation Fund was launched and it had been urged that if the contributions to the Fund were invested the annual revenue from the investment would enable the Council to embark upon a programme of definite work with every confidence that that work could be thoroughly maintained. It was hoped to raise not less than £50,000, and it now stood at the figure of £11,252.

Attention was directed to the important work engaged in by the Research and Inventions Committee. Under the Development Scheme associated with the establishment of the Foundation Fund this Committee was enabled to consider applications for financial aid in relation to inventions.

Col. F. R. McConnel was unanimously re-elected President, and Sir Henry Hibbert, Mr. Charles J. Wilson and Mr. W. Frost were elected Vice-Presidents.

In the course of his address the newly-elected President said that the Institute had taken a leading part in research work, and it was very gratifying to find that through their Journal such organisations as the Cotton Research Association, the Wool Association, and the Linen Research Association were able to form a connecting link enabling them all to work together in unison. There was no doubt that the Journal's sphere of usefulness in this direction could be greatly extended, enabling the various chemical societies and the Dyers' and Colourists' Association to keep in touch with them.

Fine Chemicals, Laboratory Glass, and Porcelain Industries

Memorandum of the Institute of Chemistry

THE following Memorandum on Fine Chemicals, Laboratory Glass, and Porcelain has been prepared by the Special Purposes Committee of the Institute of Chemistry, under the presidency of Sir Herbert Jackson :—

"The Council of the Institute of Chemistry have had under consideration a number of important issues arising from and directly relevant to the work undertaken by the Institute during the war in connexion with the production, in this country, of laboratory requirements, such as reagents, research chemicals, glass and porcelain.

"The Council recognise that the political considerations underlying some of these issues are outside the scope of the activities of the Institute; but they regard the retention of industries concerned with laboratory supplies as essential to the maintenance of a powerful chemical industry, upon which, in turn, the future of a great many other industries depends. Further, and this is the special concern of the Institute in this matter, it affects the prospects of present and future members of the profession of chemistry. The Council feel, therefore, that they are called upon to put before all users of laboratory materials certain definite facts and certain conclusions which may be drawn from those facts.

"With regard to the production of chemical reagents, it is generally known that before the war this industry in our country was very limited, and the custom prevailed of buying such substances very largely from abroad. The Council are, however, in a position to state that, notwithstanding the high cost of labour and plant and the difficulty of obtaining suitable scientific staff and operatives, a great advance has been made during the war, and since, by our manufacturers, and this has already enabled professional chemists to obtain practically the whole of the reagent chemicals necessary for their work. Many instances have proved that British manufacturers are capable of producing chemicals in a state of purity fully comparable with that of pre-war supplies from abroad, and the Council feel that in this matter it is their duty to emphasise the importance of encouraging home production.

"The production of any considerable number of chemicals for research purposes could not be undertaken during the war, but great progress has since been made, as is evident from published lists, to which additions are constantly being made. Although, in the time at the disposal of manufacturers, it has been impossible to prepare so large a number as that previously obtainable from Germany, there can be little doubt that, if encouraged, British manufacturers will be able to meet the requirements of research workers. The Council of the Institute are far from suggesting that chemists should be hampered for want of chemicals if they cannot be obtained in this country in sufficient quantity and of the right degree of purity. What they wish to emphasise is that users of chemicals should make themselves acquainted with what is available as the result of the very substantial progress made by British manufacturers. With a view to helping to spread this knowledge the Council have appointed a special Committee to deal with questions relating both to reagents and research chemicals, and will be prepared to assist chemists to obtain any materials which they may need.

"If our manufacturers were not prepared to produce and supply substances of high quality at reasonable prices, the Council would have no ground for pressing the matter, but at this critical time, when the industry can be either firmly established by encouragement or destroyed by discouragement, the Council consider it their duty to put clearly before the members of the Institute and all users of such chemicals the necessity of making themselves fully acquainted with all the circumstances and of considering the ultimate effect of failing now to aid in building up a stable chemical industry in this country.

"In respect of glass apparatus, certain manufacturers have shown enterprise, ability and readiness to produce the articles required; but it has become more and more clear that these manufacturers are under the impression that the support which was promised to them during the war and to which they confidently looked forward has not been extended to them in a measure sufficient to render them hopeful of the stability of this part of their industry.

"Acting on the advice of the Institute, with the concurrence of the Board of Trade, the Board of Education and the Department of Scientific and Industrial Research, these manufacturers are providing articles, such as beakers, flasks, &c., distinctly marked to indicate their origin; but it is well-known that unmarked articles are also being offered for sale. The Council of the Institute are aware that many complaints are made with respect to the quality and quantity of laboratory glassware sold as of British origin, but, so far as they have been able to obtain evidence at present, the complaints regarding glass of recent manufacture, marked with the names of known makers, have been few in number.

"The Institute, with the approval of the Departments above referred to, has recently issued a letter to a large number of users, urging them to purchase only laboratory glassware which bears the manufacturers' distinctive marks. This action has been taken in order to help both the users and manufacturers, since without these marks it is impossible to trace the source of any articles which may be the subject of complaint and to take steps to remedy the faults disclosed.

Support of British Manufacturers

"In repeating and emphasising this point, the Council of the Institute feel that, if *bona fide* British manufacturers who are prepared to guarantee their productions by their own marks do not receive proper encouragement, the opportunity of establishing firmly the British scientific glassware industry will be lost, and this at a time when through enterprise and research success in respect of manufacture and technique has been attained. Indeed, British-made scientific glassware, equal at least in quality to any hitherto obtainable elsewhere, is forthcoming and at a price which is not unreasonable in the present circumstances, having regard to the high cost of materials and production. There is a prospect, moreover, that when once the confidence of the manufacturers is restored and the industry established firmly, prices will compare favourably with those of articles now imported.

"The same general considerations apply to the desirability of affording manufacturers of British laboratory porcelain such support as will enable them to complete the final stages of development necessary in order to supply porcelain of at least as high quality as that obtained from abroad.

"The Council of the Institute are fully cognisant of the importance of not handicapping chemists by asking them to purchase articles so inferior in quality as to render their work more difficult or less satisfactory, and it is clearly recognised that any essential article which cannot be produced in this country of suitable quality and at a reasonable price must be obtained elsewhere. The Council feel, however, thta many of the complaints which have been made relate to apparatus of doubtful origin and, for that reason, have appointed a Committee which is prepared, in the interests alike of users and manufacturers, to investigate any complaints which may be brought to their notice.

"To summarise, the Council of the Institute earnestly desire to do all in their power to ensure that chemists shall be able to obtain their professional requirements from home sources, and to aid manufacturers in meeting successfully such requirements.

"The greater recognition, during the war, of the importance of professional chemistry not only led to the rapid absorption in industry of the trained chemists then available, but had the effect of inducing a large number of ex-Service men and others to enter upon a course of training with the intention of adopting chemistry as a profession. This affords, in the opinion of the Council, additional reason for making every possible effort to foster chemical industry in this country, and so to create a greater demand for the services of all such properly trained and qualified men."

Society of Chemical Industry

London Section

THE annual meeting of the London Section was held at Burlington House, Piccadilly, on Monday, Mr. Julian Baker presiding. Mr. E. V. Evans was elected chairman in succession to Mr. Baker, and the following were added to the Committee to fill vacancies :—Messrs. Colegate, Colman, Hulton, Stevens and Voelcker. Mr. Chapman having found it impossible to continue as a member of the Committee, owing to pressure of work on his election as President of the Institute of Chemistry, Dr. Stephen Miall has been elected in his stead. The Chairman mentioned that arrangements would be made to hold occasional joint meetings with the Chemical Engineering Group and also with the French Society of Chemical Industry, the latter on the suggestion of M. Kestner.

Paper by Dr. Lessing

Reading a paper on Fractional Distillation with Contact Ring Still-Heads, Dr. R. LESSING drew attention to the advantages of packing absorption towers and distilling columns with contact rings of the type described in his Brit. Pat. No. 139,880 (*see* THE CHEMICAL AGE, Vol. II., page 412). These rings consisted of cylinders of approximately equal height and diameter, having a gap in the circumference, and a more or less diametrical partition connected on one side with the cylinder, but out of touch on the opposite side. They were disposed indiscriminately in the tower or column at the angles which they found when dropped promiscuously into a vessel. The provision of the central partition and openings had been found to increase the efficiency of this packing over Raschig rings by increasing the contact surface available in a given tower space, and the drainage capacity.

The standard rings of 1 in. diameter by 1 in. height were used in a great variety of plants in the chemical and gas industries, amongst which might be cited, ammonia scrubbers, absorbers, washers, tar extractors, carbolate decomposers, carbonating and decarbonating towers, debenzolising stills, distilling columns and still-heads for many substances, such as tar and petroleum products, alcohols and essential oils, condensers, coolers, and heat exchangers, and were applicable wherever large interfacial surface for liquid and gas or vapour, combined with a minimum of back pressure, was essential.

Smaller sizes of Lessing contact rings down to ¼ in. diameter were now available, and were particularly useful for the construction of laboratory still-heads on the lines on which the larger rings were applied in manufacturing operations. They had a surface of 8,250 sq. cm. per litre (251 sq. ft. per cubic foot), and only occupied 13 per cent. total space, leaving 87 per cent. of free space for vapour and condensate. The resistance of such still-heads was almost negligible, and they could therefore be made of considerable height.

They were simple in construction, and the rings could be transferred from one column to another ; they could also be used in absorption towers or reaction vessels, and were therefore of general applicability. They had a remarkable fractionating efficiency, and were in this respect superior to other dephlegmators. This efficiency, he said, was due to the large surface per unit of volume, the turbulence created by frequent deflection of currents of vapour and condensate, and the consequent absence of channelling.

Avoiding Undue Condensation

In order to obtain the maximum efficiency, the author recommended lagging, or even heating of the still-head to avoid undue condensation, and to provide a reflux condenser, or to use a definite length of the still-head itself as reflux condenser ; thus, return flow and irrigation of the whole length was obtained. A ring packed still-head might then be regarded as a scrubber in which the ascending vapours were scrubbed with the descending condensate.

Still-heads could be constructed from plain glass tubes or metal pipes by merely dropping the rings into them.

The paper contained a number of graphs proving the efficiency of fractionation obtainable. From a mixture of equal portions of benzene and toluene, 47 per cent. of benzene distilled within less than 1 deg., and a like portion of pure toluene was yielded, leaving only about 5 per cent. of the total volume in the mixed middle fraction.

From a crude coke oven benzol, almost all the benzene and toluene could be distilled off each within 0·2°C. although the sample contained 30 per cent. of naphthalene and wash oil. The effect of still-head dimensions, heat insulation and reflux condensing was shown in one set of curves.

Another chart dealt with the distillation of fusel oil, and a remarkably sharp separation of the various higher alcohols from each other and from water was shown in a further graph. The fractionating effect was so sharp that chemically anhydrous alcohol might be in the lower part of the still-head, while there was sufficient water in the upper portion to separate as a distinct layer from the distillate.

Avoiding Liming

THE CHAIRMAN said in most laboratories where alcohol was used for a variety of purposes they got their industrial spirit about 93½ per cent. strength by weight. Would it be possible, by using a column of this sort, to get over fractions stronger in alcohol so as to avoid the most unsatisfactory liming ? Another class of alcohol was 80 per cent. strength by weight, and when fractionating gums and dextrines they got a crude distillate of about 80 per cent. Would a column of the sort described be useful for dealing with such a product in order to get up to the neighbourhood of 93 per cent. ?

Dr. TRAVERS said that although the possibility of the contact rings all standing sideways downwards in the cylinder was very small, and the same remark applied, perhaps, to the opening between the partition and the side of the ring, yet if this did happen the liquid would drain down to the bottom, and it occurred to him that it might be better to have the rings made of perforated metal.

Protyl Fractions in Fusel Oil

Dr. FARMER asked whether any definite comparisons had been made with the original plate rings and the present ones, which were split ? As these rings were now being so largely used, it would be interesting to have some guidance as to the size of rings and the general conditions of working which were suitable for larger scale working. Dr. Lessing had remarked on the height and width of the column, but more guidance would be welcome in regard to larger scale working.

It was always of interest to get additional information as to the composition of fusel oil, and the ring still-head gave such perfect fractionation that it seemed to be the best for the purpose. Had Dr. Lessing ever tried the lower fractions given in the table in the paper with potassium carbonate or any such drying agent, and had he found out what actual protyl fractions were obtainable from fusel oil ?

Dr. F. M. PERKIN said that channelling was very tiresome in most cases, and even in this case surely there was a chance of channelling. During the war he had occasion to do distillations in reference to benzol and toluol, and he used shell turnings; to prevent channeling he put in wooden rings between the turnings. Working on the laboratory scale, he had prevented radiation by using what was really a thermos flask, and it gave very satisfactory results. It was a silica tube, pear shaped, and it had an outer vacuum.

Captain C. J. GOODWIN was not satisfied that it was always necessary to have such a long tube, as suggested by Dr. Lessing, and thought it would be a good plan to graduate the size of the rings from the bottom upwards, having the large ones at the bottom and the small ones at the top. That would lessen the surface and reduce the quantity that had to drain back, and the quantity of liquid that was retained on the filling.

Mr. PARRISH said there should have been some comparisons between the laboratory experiments and actual practical working. Dr. Lessing appreciated the importance of surface action and local pools, in order to get an actual bubbling action, but if Dr. Lessing was referring to columns of the character about which he had been speaking, he would invariably find that on the practical scale, from the point of view of gas, it was much better to arrange a dephlegmator and fractionating column on the bubbling principle than to adopt a tower packing with rings.

Dimensioning of Still-Heads

Dr. LESSING, replying to the discussion, said he had pointed out that the application of these rings ought to make it possible to study the scrubbing action comparatively easily, and he had mentioned the work of Donnan and Masson, who at the present moment had undertaken a very considerable study of the action of absorption towers, and that these rings might

offer a means of studying this more completely; there was a great variety of applications, but so far the dimensioning of still-heads or scrubbers had been entirely empirical. Capt. Goodwin had spoken of the graduation of the rings, but that was a point which had always been applied on a large scale. It would be a practical impossibility to fill a large tube with small rings on account of the expense, and of necessity they were filled with a large proportion, up to a certain height, of larger rings, in order to get the very fine effect on the top.

With regard to the distillation of alcohol, ethyl alcohol could easily be fractionated to a concentration of 95 per cent. Beyond that it became theoretically impossible, because the constant boiling point of the mixture of ethyl alcohol did not permit of it. A 93 or 80 per cent. mixture or a very much lower concentration could be concentrated to 95 with a still-head of this type with comparative ease. With regard to Dr. Travers' point, he could not say why the rings did not all get into the same position, but it so happened that they did not. The point was that the rings had the disadvantage that they were likely to nest, but that was rather a question of efficiency in manufacture. As to the use of drying fractions, mentioned by Dr. Farmer, he had tried the effect of desiccating agents, but they were not of great use. With any alcohol higher than protyl alcohol, with repeated distillations it was possible to get out practically 50 per cent. of the water for a time, and with two or three distillations it was possible to get 70 or 80 per cent. more of the alcohol in the anhydrous form with the aid of a desiccating agent, but it really came to the same thing as ordinary distillation.

With regard to the channeling, mentioned by Dr. Perkin, with shell turnings they would have the very difficulty that was avoided with rings, namely, a corkscrew action, which carried the condensate down and allowed the vapour to come up, whilst in the case of the rings it was broken and deflected. As to the vacuum flask, he would recommend that to anybody who could afford it.

In regard to Mr. Parrish's remarks, Dr. Lessing said an interesting set of experiments had been carried out during the war with the ordinary debenzolisation of benzolised oil. In that case an ordinary distilling column of the bubbling type had been displaced by a plain gas pipe which had exactly half the cubic capacity of the other still, and was filled with rings. Nevertheless, the efficiency was very considerably improved; in fact, the debenzolisation efficiency went up from 60 per cent. to 92 or 93 per cent., and inversely the purity of the mixture of benzol and toluol that was obtained went up to a similar degree, so that the benzol-extracting capacity of the return oil was about 90 per cent. as against 60 to 70 per cent. in the other case. In that instance the higher efficiency of the ring packed column was proved absolutely.

Liverpool Section

At the annual meeting of the Liverpool Section of the Society of Chemical Industry held at the Midland Adelphi Hotel on April 29, Dr. E. F. Armstrong in the chair, the annual election of officers took place. As no nominations were received, those of the Committee were passed as follows:—*Chairman*, Dr. G. C. Clayton; *Vice-Chairman*, Dr. E. F. Armstrong; *Hon. Secretary*, E. Gabriel Jones; *Hon. Treasurer*, A. Holt; *Committee*, Messrs. C. O. Bannister, F. E. Everington, C. W. Moore, W. Ramsay, W. A. Roberts, W. Trantom, W. Clayton, G. W. Beaumont, A. E. Findley and E. L. Peck.

Sir William Pope then delivered a lecture on "Mustard Gas." The following is an abstract of the paper:—

The substance known as mustard gas, B.B.-dichlor-ethyl sulphide $(CH_2Cl.CH_2)_2S$, was introduced by the Germans about 1917. It was a colourless liquid of slight volatility and faint odour, and persisted for a long time. When soaked into earthy or other common materials, these properties in conjunction with the powerful effect which the substance exerted as vapour into atmospheric concentrations in the mucous membranes and as liquid on the skin quickly led to the recognition of mustard gas as a potent agent of chemical warfare.

The only method known in 1917 for preparing mustard gas was that used by Victor Meyer in 1886. This consisted of converting (*a*) ethylene into ethylene chlorhydrin by the action of chlorine into a hypochlorite; (*b*) converting the chlorhydrin into throdiglycol by treatment with sodium sulphide; and (*c*) the conversion of throdiglycol into B.B.-dichlor-ethyl sulphide by the action of hydrogen chloride or some similar agent. Investigation showed this was the German method.

Stage (*a*) of the process furnished a yield of about 60 per cent. under the best condition, and the subsequent stages did not proceed quantitatively, so that the average yield was not high.

Frederick Guthrie had observed in 1860 that ethylene was absorbed by sulphur dichloride SCl_2, with formation of a product, to which he assigned the toxic properties of mustard gas. On January 16, 1918, Gibson and Pope submitted to the Chemical Warfare Department a method of producing mustard gas by means of interaction, under conditions of ethylene, and sulphur dichloride and distillation of the liquid formed, and this method was expeditious. It was, however, speedily put aside in favour of another one.

In 1861 Guthrie found that a dichlor-ethyl disulphide of composition $(C_2H_4Cl)_2S_2$ had a vesicant action on the mucous membrane. Reports were then made by Gibson and Pope showing that ethylene was absorbed quantitatively by sulphur monochloride in accordance with the equation—

$$2C_2H_4+S_2Cl_2=(CH_2Cl.CH_2)_2S+S,$$

and this method was protected by a secret patent (No. 142.875, of 1918).

In spite of its apparent simplicity the reaction presented many complications. It proceeded most satisfactorily at 60, giving a practically theoretical yield. Messrs. Levinstein, who were the first to install a plant using the patent, preferred to work at about 30, a temperature at which the titrated sulphur was returned as a "pseudosolution." Other investigators, notably the Americans, Conart, Hartshorn and Richardson obtained a yield only 80 per cent. and a by-product consisting of a non-volatile oil.

On repeating the work of Gibson and Pope, using carefully prepared purified ethylene and sulphur monochloride, the reaction gave a yield of about 80 per cent. From the by-product a crystalline B.B.-dichlor-ethyl trisulphide,

$$CH_2\,Cl.CH_2S.S.S.\,CH_2CH_2Cl,$$

has been isolated.

It was found on investigation that a trial of aqueous vapour in the ethylene was without influence on the reaction, but that a little alcohol left in the ethylene had a surprising effect. At 60 pure ethylene and sulphur monochloride react giving 80 per cent. of mustard gas and certain heavy by-products from which the trisulphide was separated; the liberated sulphur being retained in solution for an indefinite time after cooling. At the same temperature the same materials in presence of a trace of alcohol vapour gave a yield of about 99 per cent. of mustard gas, whilst the major part of the liberated sulphur crystallised on cooling. The high yields described by Gibson and Pope were, therefore, traceable to the retention of a small proportion of ethyl-alcohol by the ethylene used.

A relationship was also observed between the temperature of the reaction and the proportion of by-product obtained.

It was noteworthy that the reaction was very sensitive to catalytic agents. Using sulphur monochloride which had not been especially purified the reaction proceeded badly at temperatures much above 60 per cent.; as had been pointed out by Dr. A. G. Green, the reaction proceeded satisfactorily at higher temperatures if the materials contained no iron, and working at 100° as Guthrie did, a very good yield of mustard gas might be obtained, although no trace of his disulphide could be detected.

The question of the mode in which the sulphur liberated during the reaction was returned as a "pseudosolution" presented many points of interest. If the clear solution obtained by treating sulphur monochloride with ethylene at 30° was distilled at the ordinary temperature at high vacuum, the received being cooled in boiling liquid air, pure B.B.-dichlor-ethyl sulphide distilled over; it was, therefore, impossible to accept the view advanced by Dr. Green that the 30° product was the disulphide $(CH_2Cl.CH_2)_2$ S.S, and that it was identical with Guthrie's disulphide.

A discussion followed in which Mr. D. T. Smith, chairman of the Castner-Kellner Co., Ltd., Professor Bailey, of Liverpool University, Dr. H. G. Green and others took part.

Manchester Section

AT the meeting of the Manchester Section of the "Society of Chemical Industry," held at the Textile Institute, Manchester, on Friday, Mr. W. H. H. Norris, B.A., B.Sc., F.I.C., read a paper on Methods for the Complete Recovery of Nitre Cake, a summary of which is given below.

Previous to 1915 the utilisation of nitre cake in this country was on a comparatively small scale. During the war over 80 per cent. of the considerably inceased production was employed, but largely by methods which completely wasted the sodium sulphate contents. With ample supplies of sulphuric acid, only those methods of recovery which stand were economically sound, and the production of by-products salt cake in a pure and marketable form would assist in this direction.

The oldest method for complete recovery was by the salt cake furnace, and this well-known operation called for little comment. Expenditure on hard coke at present prices was a considerable charge, and where hydrochloric acid was the valuable product, nitre cake had little chance of competing with sulphuric acid because of the reduced yield per furnace, and the impurity of acid produced when nitre cake was employed.

Many other methods had been suggested, but the author did not know that any of these had been carried out on a manufacturing scale with the exception of the following:—Nitre cake might be used for ammonia absorption producing sulphate of ammonia with the additional formation of sodium sulphate suitable for glass makers.

A process was described which had been worked out in conjunction with H. S. Denney and C. W. Bailey; in this process 220 tons of nitre cake were used to produce 157 tons of salt cake and 87 tons of ammonium sulphate. The plant was run in conjunction with a Mond gas ammonia recovery plant and proved successful in operation; process figures and costs were given.

The method, said Mr. Norris, was of wide application and might be used either with ammonia absorption towers and dasher washers, or in the ordinary saturator as employed on coke oven and gas works liquor recovery plants. The operation worked up all its own waste liquors, and required the minimum of handling and evaporation.

Briefly the nitre cake was digested with hot process liquor and the whole of its contents of salt cake were precipitated in a pure form, while all the acid was taken into solution. The mixture was filtered and washed in centrifugals and the acid liquor resulting used for ammonia absorption either in the saturator or other absorption plant. The neutralised liquor was evaporated in the usual way for the deposition of sulphate of ammonia containing over 24 per cent. free ammonia, but concentration was checked when a definite density was reached and the process liquor run back to the digestor to extract the acidity from a fresh charge of nitre cake.

A new process for recovering sodium sulphate and a strongly acid liquor, from nitre cake, was also described. The residue from the retort might be run off and pelletted in the digestor in the presence of liquors of a regulated composition. A second liquor treatment in the same vessel produced pure anhydrous sodium sulphate (96 per cent.) corresponding to 43 per cent. of the original salt cake content. The acid liquor represented over 60 per cent. strength; it might be diluted for transit to about 25 per cent. acidity with no danger of crystallising out on cooling to 10°C.

Yorkshire Section

At the annual meeting of the Yorkshire Section, held at the Queen's Hotel, Leeds, on Monday, Mr. S. H. Davies in the chair, Mr. Davies was re-elected as chairman and Mr. B. A. Burrell as hon. secretary and treasurer.

Committee: Messrs. John Evans, W. McD. Mackay, L. Neaverson, A. B. Searle, Harold Waites, George Ward, W. B. Hill, F. W. Richardson, C. F. Finn, H. J. Hodsman, P. E. King and B. Watmough.

Professor Smithells, in the course of a lecture on "Modern Views of the Chemical Atom," said Langmuir's conception of the arrangement of the electrons in the atom embodied an advance in the fundamental basis of chemical theory as great as anything that had taken place since the time of Dalton. Every atom of matter consisted, according to this theory, of a mass positively charged with electricity, round which were disposed electrons negatively charged with electricity. The different elements consisted of different numbers and differing arrangements of the electrons, and Langmuir devised with great ingenuity an arrangement which threw more light on the reasons for the behaviour of different elements in combination and alone than any other arrangement yet devised.

The electrons were arranged around the nuclear mass in forms symmetrical or otherwise, according to the number of electrons going to form the particular element. Where the number permitted of a perfectly symmetrical arrangement, the element which resulted was of stable type. There was a tendency for unsymmetrically constructed elements to complete their symmetrical form by seizing, when opportunity offered, electrons from other elements or by association with other atoms, and with this tendency Langmuir connected the chemical activity of the particular element and its degree of instability.

Dr. Smithells showed a number of models carrying out the ideas of Langmuir, and expressed his conviction that the new theory had come to stay, and would throw light upon the chemical behaviour of the elements which would make a bright new day for future generations of chemists.

Chemical and Dyestuff Traders

General Meeting of the Association in London

ON Friday, April 29, a special general meeting of the Chemical and Dyestuff Traders' Association was held at the offices of the Association, 22, Buckingham Gate, S.W.1. Mr. F. T. T. Reynolds presided.

Chairman's Comments on Negotiations

The CHAIRMAN stated that the meeting had been called to consider, among other matters, the decisions arrived at at a joint meeting of that Association and the British Chemical Trade Association respecting the proposed fusion of the two bodies. Unfortunately, owing to regrettable misunderstandings, the decisions of the joint meeting could not be regarded as representative. The original proposal of the Chemical and Dyestuff Traders' Association was that the joint meeting should be held at some central point in the country and that the decisions should be left to those sufficiently interested to attend or to be represented personally. Owing, however, to the Chemical Trade Association insisting on proxy voting and to the meeting being held in London, where most of their members were, the Chemical and Dyestuff Traders' Association, although their organisation included such important centres as Manchester, Liverpool, Leeds, Glasgow, and other northern cities, agreed to the meeting being held in London, and arranged, as suggested by the other Association, that their distant members should be represented by proxy. This was all the more necessary in the present instance because of the uncertainty of railway travelling owing to the coal strike. It was not until the day before the joint meeting that the British Chemical Trade Association announced that voting would not be by proxy, although they had originally insisted on it and had never withdrawn the condition. The result was that although the Chemical and Dyestuff Traders' Association had a properly authorised voting strength of about 140 at the meeting these votes were entirely disregarded by the meeting and the British Chemical Trade Association, with an attendance of about 70, were able to carry resolutions against a body possessed of double their voting strength. That fact largely vitiated the decisions arrived at, and the spirit in which a certain section of the other Association had acted was not calculated to assist the negotiations.

A second point, he stated, required to be explained. It had been intended that the meeting should be a private conference, in order that differences on points of detail might be more frankly discussed and if possible overcome in a friendly spirit. All the arrangements for the meeting were made jointly and in consultation between the two bodies, but at the last moment, without consultation with the Chemical and Dyestuff Traders' Association, the other Association issued communications to the Press, containing ex parte statements on the points to be considered, and actually invited non-members and reporters to be present. This Association regarded this procedure as a serious departure from the

accepted rules of public life. One unfortunate result was that Mr. Percy Ashley, of the Board of Trade, who had agreed to preside over private and friendly deliberations, withdrew from the chairmanship as the meeting was to be of a formal and public character.

Essential Conditions

Incidents of this kind, Mr. Reynolds, said, did not assist towards a good understanding. While the Chemical and Dyestuff Traders' Association were, as always, sincerely anxious to effect a union on reasonable and honourable terms they were emphatic on three points—that the membership of the Association should be a genuinely British membership, that it should be limited to traders mainly in chemicals and dyestuffs, and that the larger and old-established British merchanting firms should hold the place in any representative Association to which their weight and reputation in the trade entitled them. It could not be overlooked that speakers who took an active part on behalf of the British Chemical Trade Association were representatives of American concerns, while the membership was known to include some who were distinctly outside the merchant class.

Although what had happened might have supplied justification for breaking off the negotiations altogether, out of their desire to promote the unity of the merchant interest and their regard for the proportion of genuine British merchants associated with the other body, they had decided to go on in the hope of promoting unity, and they were hopeful that such a result might still be achieved.

The meeting considered in detail the decisions of the joint meeting and authorised a communication to be sent to the British Chemical Trade Association defining exactly the terms on which the negotiations might be continued.

Work of the Association

A comprehensive report was presented on the work of the Association. In this it was stated that the Association, established in Manchester early in 1920, had fully justified its existence—in the number of old-established and influential firms it had brought into active association, in its defence of merchant interests affected by legislation and departmental regulations, and in impressing upon the trade the need of collective action.

In reference to the Dyestuffs Act it was stated that whatever may have been thought of the need for protecting our newly-established dyestuffs industry the claim of the merchant class to direct representation upon any Licensing Committee seemed unanswerable. In spite, however, of the very strong representations made, the merchants had no direct voice in the administration of a system which affected them at least as much as any other class. This omission was regarded as a grave injustice to the merchant community and as a weakness in the Committee itself.

Reference was made to the steps taken to secure the removal of the serious restrictions on export which existed up to an early period of this year. It was with great satisfaction that the Association was informed early in the year that certain products which had been held up for some time would be freed for export without the need of a manufacturer's certificate and this welcome relaxation was speedily followed by a decision to abolish practically all the existing restrictions on export trade. Another matter which the Association had taken up was the question of ad valorem freight rates, and negotiations were still in progress respecting the policy of certain manufacturers of dyestuffs in refusing to supply British merchants with their products for export to markets where they have their own selling and distributing agencies.

The difficulties raised by the German Reparation (Recovery) Act, the report stated, were too familiar to merchants to need description in detail. It was clear that the effect of the Act would be to double the price of goods imported from Germany and that the additional cost must inevitably fall upon the British purchaser. The Act has created so impossible a situation between British and German business houses that it could not be expected to continue permanently in force, and the only hope of immediate improvement lies in the expectation that Germany will offer fresh proposals.

The Ways and Means resolutions of the Government containing proposals for the safeguarding of British industries were receiving attention. A feature of these resolutions which was causing serious alarm to merchants was the immense powers they propose to vest in the Board of Trade. The tendency of modern legislation is towards the transference of more and more power to departmental bodies, not only of administration but also of initiation and even of taxation. In view of the experiences during the war period of official regulation of Trade this tendency can only be viewed with alarm and if allowed to continue might well be disastrous to national interests.

At the beginning of the year the Association formulated a definite plan of campaign for establishing local centres throughout the country and developing the work of the organisation on national lines. Having, however, been approached by the B.C.T.A. with a view to the fusion of the two bodies these plans were temporarily suspended, and for some time past negotiations between the two Associations had been proceeding. Whatever might be the result, it was a matter of the highest importance that the merchant community of the whole country should be definitely linked up by some national organisation, so that merchants might bring their proper weight to bear on all schemes for the regulation of industry and receive adequate recognition by Government Departments.

The meeting concluded with a vote of thanks to the chairman proposed by Mr. Ashworth (Manchester), and seconded by Mr. Gordon (London).

Potash in Agriculture

ON Tuesday evening last a lantern lecture on the above subject was given before the members of the Wadhurst and District Farmers' Club by Mr. G. A. Cowie, M.A., B.Sc., A.I.C. At the outset the lecturer briefly described the essential function of potash in crop production. It was concerned chiefly with the mechanism by which sugar and starch were produced in the green leaves of plants and then passed on to the root, ear, or stem for storage. Where potash was deficient this important economic process experienced "a slowing down." Similarly, potash was connected with the manufacture of protein matter, as a high percentage of protein in seeds, as in the leguminous plants, was always associated with a relatively high potash content.

It would follow from the above that potash played a comparatively more important part after the initial stages of growth. In other words, the influence of potash was primarily directed towards the strengthening of the plant and the building up of root, grain or fruit. This effect was often not markedly obvious to the eye and could only be satisfactorily determined by exact weighing of the produce in a comparative trial carried out on strictly scientific lines. The qualitative aspect of the improvement produced by potash in the crop yield was also an important factor.

In accordance with its theoretical function, careful practical investigation had determined that potash was relatively more important for crops whose economic value depended on starch or sugar production, such as potatoes, mangolds, turnips, &c. The partiality to potash of leguminous crops, such as clovers, beans, lucerne, &c., was more difficult to explain, but here a similar effect of potash was probably brought into play through the production of sugar or starch for the benefit of the nitrogen-fixing type of organism which was known to live in close association with these plants. In the case of cereals the effect of potash was chiefly manifested in the formation of heavier and plumper grain and in the production of straw which was markedly stronger and more resistant to lodging.

The qualitative influence of potash was often noted in the increased vigour of the crop. Evidence showed that plants liberally treated with potash were appreciably less susceptible to certain fungoid diseases. A marked instance of this was the relative freedom from rust enjoyed by the potash-treated plots in the classical continuous-growing wheat experiment at Rothamsted. The harder or "woody" leaf tissue, which potash helped to produce, formed a protection against fungoid attacks. This probably explained the greater resistance of potash-treated crops to ordinary potato blight, which had admittedly been more prevalent in recent years in the absence of adequate potash supplies. Tomato stripe and several other kindred diseases could also be largely prevented by potash applications.

Soils, of course, varied greatly in their potash requirements, but it could be safely assumed that soils of a sandy, gravelly, peaty or chalky nature would profitably respond to regular potash dressings. There was a considerable amount of evidence

to show that the chief factor limiting crop production on these types of soils was their marked deficiency in potash. The best form in which potash could be supplied to any particular soil and for any particular crop was a question on which considerably more light was wanted. Dung was, of course, the ideal source of any plant food, as it never had any bad secondary effect on the soil, but, on the contrary, produced a simultaneous ameliorating influence on its physical condition. The misfortune was that dung was seldom available in sufficient quantity on the farm for all requirements.

Amongst the artificial potash fertilisers Kainit still remained in this country the most popular. Its low price per ton no doubt appealed to many farmers who had not yet appreciated the saving in carriage and in general handling entailed by the use of higher-grade potash fertilisers. In many cases, however, the preference for Kainit was well founded, especially for the poor, sandy soils. The Magnesia salts, provided by ordinary Kainit, had also proved in some recent trials definitely effective in increasing the crop yield. For application at sowing time a concentrated potash fertiliser like the muriate or sulphate was preferable. In the case of potatoes the consensus of evidence in Great Britain, both experimental and practical, was definitely in favour of the use of sulphate of potash. It produced a "mealier" potato, with a higher starch content, and with superior cooking and keeping qualities. The sulphate of potash was also better for tomatoes and, indeed, for all horticultural crops where intensive manuring was practised and where an excess of chlorides might prove harmful.

Deals in Salt Cake

Central Profiteering Committee Orders Refund

A SITTING of the Tribunal appointed by the Central Committee to investigate allegations of profiteering on the part of wholesale firms was held at the Office of Works, London, S.W., on April 28, under the presidency of Mr. W. Marshall Freeman, when a complaint was considered which had been lodged by W. Barnes & Co. (London), Ltd., chemical and produce merchants, of 40, Cheapside, E.C. 2, regarding the price charged for salt compound or salt cake, by Mr. John H. Clark, 144 & 146, Bethnal Green Road, E. 2. The complainants alleged that salt cake or salt compound, sold as 84-85 per cent. of sulphate of soda, was charged for at the price of £6 17s. 6d. per ton by the respondent, when it was alleged to have cost him 35s. per ton.

Mr. Davis, solicitor, appeared for the respondent, and at the outset took an objection to the matter being investigated by the Tribunal. He pointed out that certain legal proceedings were pending. The Chairman: In what way do you suggest that your rights may be prejudiced? Mr. Davis: If we go into the matter now certain points are sure to come out and obviously must prejudice my client. He further contended that the Tribunal had no power to try the case. The goods in question were purchased for export. Section 1 (10) of the Profiteering Act laid it down that nothing in the Act should apply to the sale of any article for export from the United Kingdom. The Chairman said that point could be raised after the evidence had been given.

Evidence on behalf of the complainants was given by Mr. J. Bachman, a director of W. Barnes & Co. (London), Ltd., who said that last August Mr. Clark had interviews with them, and a contract was entered into for the purchase of 415 tons of salt compound. Witness produced the contract entered into with the respondent, which stated, "I confirm having sold to you to-day, through Mr. C. Cowen, about 415 tons salt compound, consisting of 84-85 per cent. sulphate of soda, 4·5 per cent. nitrate of soda, 0·5 per cent. insolubles, according to sample submitted to you, deliveries loose in trucks at Brentford G.W.R. Coal Station, in weekly deliveries of about 50 tons, at £6 17s. 6d. per ton." The witness said that after the contract was entered into five deliveries were made totalling 300 tons, and the invoices received totalled £2,062 10s. After the 300 tons was delivered, there was a dispute as to the quality. Owing to the dispute further deliveries ceased, but the complainants had paid the respondents £2,062 10s., no discount or deduction having taken place.

The Chairman: Your complaint is that the price charged of £6 17s. 6d. a ton was excessive? Witness: Yes, Sir.

The witness said that the market price of similar goods in pre-war days would probably be about 30s. a ton. After the 300 tons had been delivered witness examined some of the salt compound at Hull, and it looked like waste. He described it as "dirty sulphate of soda."

The Chairman enquired what profit was made on such salts in pre-war days by the merchants who handled it, and the witness replied that it would be from 5s. to 7s. 6d. a ton. At the present time the profit would be about £1 7s. 6d. a ton. The person to whom the complainants sold had refused to take delivery at Hull, while W. Barnes & Co. had refused to take the salt and it was in the possession of the railway company. In answer to Mr. Davis, the witness said that his firm re-sold the salt to Mr. Poliakoff, general merchant, of 123, Cannon Street, E.C. They presumed that the salt was required for export by their buyer, but they were not certain.

Mr. Benjamin Sproule, manufacturers' agent and merchant, of 122, Royal Exchange, Manchester, said that on March 29, 1920, he purchased from the Disposals Board about 500 tons of crude sodium sulphate at £1 a ton. On the same day that he purchased the salt he re-sold it to Mr. John H. Clark at 35s. a ton, f.o.r. Swindon.

Mr. Davis submitted that the salt in question was not an article which was in common use by the public. It was an article which was rarely used, and therefore did not come within the provisions of the Act. He also contended that as the goods were sold for export the Profiteering Act did not apply. Mr. Davis stated that he was afraid he could not carry the case any further that day, and asked for an adjournment so that he could call scientific witnesses. The Chairman replied that the case had been pending for a long time, and the respondent had had plenty of time in which to prepare his case. The enquiry would have to proceed.

Mr. Davis intimated that he could not take the case further that day, and would not call the respondent to give evidence.

In giving the decision of the Tribunal the Chairman said they were of the opinion that the profit made or sought to be made by the respondent was unreasonable. The price which would have yielded a reasonable profit would have been 50s. per ton, as against the £6 17s. 6d. actually charged. The result of the matter was that the Tribunal ordered the respondent to refund to the complainants a sum of £1,246 17s. 6d. That amount represented the excess profit on 285 tons of the material. It was competent for the Tribunal to recommend a prosecution, but they would not, however, recommend a prosecution on account of the various actions that were pending.

Affairs of Casson Chemical Co.

A MEETING of the creditors of the Casson Chemical Co., Ltd., was held on Tuesday at Caxton Hall, Westminster, S.W., when the chair was occupied by Mr. Parkin S. Booth, accountant, of 28, Kimberley House, Holborn Viaduct, London, E.C., one of the liquidators of the company.

A statement of affairs was presented, as at April 14 last, which showed ranking liabilities of £25,186 17s. 11d. There were 325 trade creditors whose claims aggregated £7,471 3s. 9d., while the bank were interested for £15,243 18s. 8d. There was also a fully secured creditor for £3,000, holding securities valued at £4,500. The assets were estimated to realise £10,850 5s., from which had to be deducted £1,062 15s. 3d. for preferential claims, leaving net assets of £9,787 9s. 9d., or a deficiency as regarded the unsecured creditors of £15,399 8s. 2d.

The statement was explained in detail by Mr. Booth, who stated that it was his desire that a committee of the principal creditors should be appointed, and if they thought it necessary Counsel's opinion could be taken.

On the motion of the representative of the bank it was unanimously decided that no application should be made to the Court, but that the voluntary liquidation should be continued with the present liquidators. An advisory committee of the representatives of five of the principal creditors was also elected.

According to an agency report from Budapest, the Viennese geologist, Professor Edward Sueys, has discovered large deposits of ALUMINIUM in the Bakeny Forest. A company, with a capital of 3 million crowns, is stated to have been formed to exploit the deposits.

Chemical Matters in Parliament

Profiteering Act

Replying to Mr. Thomas Stanford (House of Commons, April 28), Mr. Baldwin said the Conference of Members of the Central Committee established under the Profiteering Acts, which has been inquiring into the subject of the multiplication of transactions in the distribution of commodities, held its final meeting on April 21. He understood that a communication embodying the views of the conference would be submitted to the chairman of the Central Committee.

In reply to a question by Col. Sir A. Holbrook, Mr. Baldwin said the Profiteering Act Department would be wound up as soon as possible after May 19.

Gretna Factory

Major W. Murray (House of Commons, April 29) asked the Secretary of State for War whether it was intended to close the factory at Gretna; and whether he could now make any statement in regard to the permanent disposition of the factory and the Government's intentions regarding it?

Sir L. Worthington-Evans said the question of the future of Gretna depended upon the settlement by the Government of their general policy regarding the national factories. This subject, which raised issues of the highest importance, was under the consideration of the Cabinet, and he would make a statement as soon as a decision was reached.

Key Industries Bill

Captain Wedgwood Benn (House of Commons, May 2), asked the Lord Privy Seal the reason for the delay in the introduction of the Safeguarding of Industries Bill; and whether any representations on the subject had been made by supporters of the Government to one of the Patronage Secretaries of the Treasury?

In reply Mr. Shortt said the sole reasons for the delay had been the interruption of Government business caused by the Ministerial changes consequent on the resignation of the late Leader of the House, and the industrial dispute in the coal trade. He could not answer questions as to communications actual or imaginary alleged to have passed between the Government and their supporters.

Replying to a question by Mr. G. Terrell, Mr. Shortt said he could not state when the Financial Resolutions to the Key Industries Bill would be taken.

Profiteering Act (Explosives)

Mr. Waterson (House of Commons, May 2), asked the President of the Board of Trade whether he was aware that Nobel Industries, Ltd., had practically a monopoly of important explosive constituents used in the manufacture of ammunition; whether the Central Profiteering Committee had had the matter under consideration; and, if so, had any recommendation been made in respect to immediate legislation on this matter in the national interests, or would the Committee of Inquiry be disbanded without completing its work?

Mr. Baldwin said a Sub-committee under the Profiteering Acts was appointed on the 14th September last to inquire into the existence of any trade combinations of makers of explosives, and the effect of any such combinations, if found, upon supplies and prices. The Sub-Committee had not yet made any recommendation, but he hoped to receive their Report before the expiration of the Acts.

Government Laboratory

Replying to Major Hills (House of Commons, May 2), who asked the Chancellor of the Exchequer under what rates of pay men and women were now being appointed at the Government laboratories at Clement's Inn; and on what date the present scale came into force. Mr. Young said the initial scales for future entrants to the chemical assistants' grade at the Government laboratory would be £160 10s.—£200 for men and £140 10s.—£180 for women. The latter scale would come into force when occasion arose to engage any new women chemical assistants.

Products Corporation

Lieut.-Colonel Sir F. Hall (House of Commons, May 2), asked the President of the Board of Trade what actual cash payment had been made in respect of the 50,000 £1 shares, constituting the nominal capital of the Products Corporation, Ltd.; what was the annual turnover of this firm and of the businesses which it had acquired; and if he could state from what sources this company, with its small capital, derived the financial backing necessary to the successful carrying on of the business transactions in which it was involved; whether the business of the Products Corporation, Ltd., had been established at the instigation of the German financier, Herr Stinnes, to continue the sale in this country of German chemicals and other products, formerly carried on by firms which had been voluntarily dissolved because of their known German connexions; and whether, having regard to the importance of making this country independent of Germany in regard to the supply of chemicals and other key products for which this Corporation acted as agent for the Stinnes industrial group, he would institute an inquiry into the manner in which the firm came into being and the steps which it might be desirable to take to prevent German financiers obtaining a control of British markets in this secret manner?

Mr. Baldwin said inquiries were being made into the position and connexions of this company, but he was not yet able to make a statement on the subject.

Sir F. Hall asked if the right hon. gentleman was aware that it was common knowledge in the City that a concern which had been purchased by the Products Corporation could not carry on its business with the amount of capital it had; that it would involve millions of money, and whether he knew there were supposed to be German financiers at the back of it; would he take steps to ascertain the actual facts?

Mr. Baldwin: That is what we are endeavouring to do.

British Chemical Plant

Work of the Manufacturers' Association

WITH a view to promoting closer co-operation between British chemical and British chemical plant manufacturers, the Association of British Chemical Manufacturers in May last invited representatives of the plant manufacturers to discuss the matter with the Fine Chemical Group of the Association of British Chemical Manufacturers. As a result of this and subsequent discussions, the British Chemical Plant Manufacturers' Association was formed in July and became affiliated with the Association of British Chemical Manufacturers.

The membership consisted of 19 firms with Mr. J. H. Rawson as chairman, Mr. L. M. G. Fraser, vice-chairman, Mr. E. A. Alliott, hon. treasurer, and Mr. W. J. U. Woolcock, M.V., as secretary.

It was decided at an early date that the question of standardising jacketed-pans with stirrers and covers, boiling-pans and filter-press plant was deserving of immediate consideration. Joint sub-committees were set up to consider these matters, and they are now making good progress. A joint research committee was also appointed to investigate new types of plant in use in other countries and discuss any questions bearing upon the improvement of chemical plant in the United Kingdom. In view of the fact that German manufacturers of chemical plant employ nickel to a much greater extent than the British plant manufacturers, the Committee is now considering the uses to which this metal could be put in chemical plant. In this connexion, it is stated, very valuable assistance is being received from the Mond Nickel Co. The question of the use of 12 per cent. chromium steel is also being investigated.

The Faraday Society

AT the ordinary meeting of the Faraday Society, to be held at Burlington House, Piccadilly, W.1, on May 9, the following papers will be read: "The Problem of the Fuel Cell," by E. K. Rideal and U. R. Evans; "The Solubility of Small Particles and the Stability of Colloids," by L. F. Knapp; and a "Note on a Formula Expressing the Variation of Surface Tension with Temperature," by Professor F. G. Donnan. Continuation of the discussion held at Manchester on the following papers: "Part I. Some General Considerations and a Discussion of the Methods of Measuring Interfacial Tensions," by Allan Ferguson, and "Part II. A Modification of the Capillary Tube Method for the Measurement of Surface Tensions," by Allan Ferguson and P. E. Dowson, will be continued.

Soda Sulphate in Soda Cake

Arbitrator's Decision Confirmed

IN the King's Bench Divisional Court on April 28, before Justices Bray and Lush, the case of Wm. Adolph & Co., Ltd., *v.* The Keene Co., was argued on the appeal of the latter Co., against an umpire's decision in favour of the plaintiffs.

It was explained that the dispute arose over a contract by which the Keene Co. were to sell to the respondents 100 tons of salt cake which should contain 95 per cent. sulphate of soda. The goods were shipped to Christiania, for delivery to the Moss Glass Works Co., but the latter complained of the quality. A sample was taken from bulk and sent to London. At respondent's order the sample was analysed and the analysts reported only 44 per cent. of soda sulphate present.

On arbitration the arbitrators disagreed, but the umpire subsequently made an award in favour of Messrs. Adolph. The Keene Co. now appealed against that award on the ground that the umpire, by accepting the umpire's report without strict legal proof, was guilty of misconduct.

After hearing legal argument, their Lordships held that the umpire had correctly accepted the evidence and all the documents in dispute. The appeal was therefore dismissed with costs.

German Reparation (Recovery) Act

THE Board of Trade have issued Order No. 7, under the German Reparation (Recovery) Act, 1921. This Order provides that articles proved to have been delivered by Germany to any Allied or Associated Power by way of reparation shall be exempt from the provisions of the Act.

Catalogues Received

MILLARS' Timber & Trading Co., Ltd., of Pinner's Hall, Great Winchester Street, E.C.2, send us a folder in two colours describing and illustrating their stone and ore crushers. These machines are supplied with steel plate screens or elevators, and are mounted on travelling wheels if required.

Recent Wills

Mr. C. H. Turner, of Falinge Corner, Rochdale, of Messrs. Turner Brothers Asbestos Co., Ltd., and the African Asbestos Co., Ltd.	£269,662
Mr. G. H. L. Parsons, of Aldrington, Streatham Park, S.W. interested in Ashton & Parsons, Ltd., wholesale chemists, Ludgate Hill, E.C.	£127,335
Mr. J. W. Norton, of Fulwood Park, Sheffield, carrying on business as John Norton & Son, lead and glass manufacturers, Queen Street, Sheffield	£30,905
Mr. C. B. Shuker, of Willestrew, Lamerton, Devon, formerly of Hornacott Manor, Launceston, chemist	£16,716
Mr. James Wilson, of Hubert Street, Great Harwood, Lancs, chemist, a director of the Union & Deveron Mills	£13,812
Sir C. A. Cameron, of 27, Raglan Road, Dublin, Public Analyst in Dublin since 1862	£11,120
Mr. G. W. Hardy, of West Bank, Alexandra Park, Scarborough, retired chemist and druggist ...	£10,592
Mr. E. H. W. Butterworth, of Ullet Road, Liverpool, oil merchant	£8,809
Mr. W. Flowers Ware, of London Wall, E.C., a director of the Carbon Products and Oil Distillation, Co., Ltd.	£5,000
Mr. P. Griffith, of High Street, Shepton Mallet, chemist	£3,599/5/6

At a meeting of the Royal Society on May 12 the following papers will be read: A Liquid Oxygen Vapourizer, by E. A. Griffiths, communicated by Dr. E. H. Griffiths, F.R.S.; Some Experiments on the Catalytic Reduction of Ethylene to Ethane, by Dorothy M. Palmer and W. G. Palmer, communicated by Sir William Pope, F.R.S.; The Catalytic Activity of Copper, Part II., by W. G. Palmer, communicated by Sir William Pope, F.R.S.; The Total Heat of Liquid Carbonic Acid, by Prof. J. F. Jenkin and D. N. Shorthose, communicated by Sir Alfred Ewing, F.R.S.; and The Viscosity and Molecular Dimensions of Gaseous Cyanogen, by Dr. A. O. Rankine, communicated by Professor H. L. Callendar, F.R.S.

From Week to Week

Working men are allowed to use the CHEMICAL LABORATORY at Rugby School in the evenings.

Mr. LEO. MALEMPRÉ, of the British Dyestuffs Corporation, Barcelona, recently paid a business visit to Madrid.

Professor K. GREABE, of Frankfort-on-Main (the discoverer of synthetic alizarin), recently celebrated his eightieth birthday.

FERRO-MOLYBDENUM, ferro-chrome and ferro-tungsten are now being produced by the Chemische Fabrik Griesheim-Elektron, of Frankfort-on-Main.

THE PLANT of the American Potash Company, at Antioch, Nebraska, stated to be one of the largest in the world, recently sustained considerable damage by fire.

Mr. ROBERT MELDRUM, formerly of London, has taken up a position with the Canada Bread Co., Ltd., of Toronto, for whom he will establish a new laboratory.

The Yorkshire Indigo, Scarlet and Colour Dyers, Ltd., of Leeds, have purchased, as from Jan. 1 next, THE BUSINESS of Mr. Henry Fawcett, indigo dyer, of Kirkstall Road, Leeds.

Mr. PERCY DAVIES, secretary of the Cleakheaton Chemical Co., was married on April 28 at Central Chapel, Cleakheaton, to Miss Ida Barstow, youngest daughter of Mr. and Mrs. Arthur Barstow, Greenhead, Cleakheaton.

DAMAGE to the extent of about £2,000 was caused by fire on May 1, at the premises of G. L. Greenwood & Co., Ltd., manufacturing chemists, of New Road Side, near Keighley, where a process of naphtha distillation from wood is carried on on a large scale.

M. Fl. Bourgeois, 18 and 19, Great St. Helens, London, E.C.3, has been appointed sole consignee for the United Kingdom for the sale of anhydrous ammonia manufactured by the Société d'Electro Chimie & d'Electro Metallurgie of Paris, and has stocks in this country to meet buyers' requirements.

The Metropolitan Technical Branch of the National Association of Local Government Officers is holding a meeting to discuss the problem of fuel efficiency in relation to steam raising costs, at 8 p.m. on May 10. The Association has invited Mr. E. W. L. Nicol, M.I.Mar.E., Fuel Expert to the London Coke Committee, to read a Paper and open the discussion.

Mr. John Beaumont Wood, chemist and drysalter, of Bridge Street, Lockwood, Huddersfield, died on Wednesday at the age of 56. He was formerly the president and secretary of the Huddersfield Chemists' Association, and represented the Lockwood Ward on the Huddersfield Borough Council from 1912 to 1919, as a Conservative. He leaves a widow and family.

During March the United States War Trade Board granted licences for the IMPORTATION OF 197,347 LB. OF DYESTUFFS. To this total Switzerland contributed 107,905 lb., Germany 41,102 lb., while Great Britain supplied 48,340 lb., as against 500 lb. for the previous month. The table issued by the War Trade Board gives the British colours as alizarine red I.P. paste; anthracene brown paste; Coomassie navy blue 2 R.N.X.; Cross dye green 2 G. Conc.; Durasol acid blue B; and Thional brilliant green 4 G.X.

Mr. W. M. VALON, for 11 years manager and engineer of the Corporation Gas Works at Stafford, has accepted the position of technical director with Major & Co., Ltd., chemical manufacturers, 12, Norfolk Street, London. At a farewell gathering last week, which was presided over by Alderman R. J. Young (chairman of the Corporation Gas and Electricity Committee), a portable typewriter, the gift of the staff and employees of the Gas and Electricity Departments, was handed to Mr. Valon. Mr. H. T. Poulson is the new gas manager.

An original profit-sharing scheme is in operation at the works of the BRITISH CYANIDES CO., LTD., Oldbury. The employees are guaranteed a minimum wage adjusted according to the cost of living, and the shareholders a minimum dividend of 6 per cent. For every 1 per cent. above this dividend and up to a total of 10 per cent., a sum equal to 2½ per cent. of the total wage bill is set aside for the employees. For every additional 1 per cent. dividend an additional 1 per cent. is set aside. Similar provisions are made to balance any profits placed to reserve.

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A Citric Acid Deal

AT Manchester on Monday, before the Stipendiary magistrate, Henry S. Devonport was charged on remand with obtaining £638 by false pretences.

For the prosecution, it was stated that in satisfaction of an accepted order for 16 cwt. of citric acid defendant sent 20 casks of bicarbonate of soda as prepared for the making of mineral waters.

Mr. W. L. Hockin, for defendant, pleaded that he had been made desperate by business losses. Since his arrest, however, it had been found that he was quite solvent, with an estimated surplus of assets amounting to between £500 and £600.

The magistrate, passing sentence of three months imprisonment, said he thought it was a case of deliberate fraud

Patent Literature

Abstracts of Complete Specifications

160,847. ASSIMILABLE PHOSPHATES, MANUFACTURE OF. J. J. Morel, 1, Rue Moliere, Grenoble, Isere, France. Application date, August 14, 1920.

Natural calcareous phosphates or other phosphates such as bone phosphates are heated in a rotary furnace of the Hargreaves type to a temperature not exceeding 1,000°C. A current of sulphur dioxide, air and steam is passed through the furnace, with the result that mono-calcium phosphate and calcium sulphate are produced. The amount of sulphur dioxide is determined by the amount of calcium phosphate in the raw material, and it should constitute about 8 per cent. of the gaseous mixture passed through the furnace. The proportions of air and steam may vary considerably. The reaction is facilitated by the addition of about 1 per cent. of calcium chloride to the raw material. The final product consists of monocalcium phosphate with some dicalcium phosphate, and is equivalent to commercial superphosphate.

160,848. HYDROXYAZO DYES, MANUFACTURE OF. G. T. Morgan, The University, University Road, Edgbaston, Birmingham, and British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London, W.C. 2. Application date, July 17, 1919.

The object is to obtain hydroxyazo-compounds from 4 : 6-diamino-1 : 3-xylene and the diazo-derivatives of the orthoaminophenols and orthoaminonaphthols and their nitro-, sulphonic and carboxyl derivatives. In an example, picramic acid is dissolved in caustic soda, sodium nitrite is added, and the solution of sodium picramate is acidified with hydrochloric acid. The mixture containing diazotised picramic acid (4 : 6-dinitro-phenyl-2-diazo-1-oxide) is added to an ice cold solution of 4 : 6-diamino-1 : 3-xylene in water. The mixture is subsequently heated and the dye is precipitated. The dye produces orange-brown shades on wool, which may be intensified by after-chroming or by the meta-chrome process. In another example the picramic acid is replaced by 2-hydroxy-4-nitro-aniline.

160,853. ARYLSULPHONYL AND ARYLENEDISULPHONYL DERIVATIVES OF 1 : 4-NAPHTHYLENEDIAMINE AND ITS SULPHONIC ACIDS, MANUFACTURE OF. G. T. Morgan, City and Guilds Technical College, Leonard Street, Finsbury, London, E.C. 3, and the Imperial Trust for the Encouragement of Scientific and Industrial Research, 15, Great George Street, Westminster, London, S.W. 1. Application date, August 6, 1919.

Arylsulphonyl-1 : 4-naphthylenediamines $Ar^1.SO_2.NH.C_{10}H_6.NH_2$ and arylenedisulphonyl-bis-1 : 4-naphthylenediamines $Ar^{11}(SO_2.NH.C_{10}H_6.NH_2)_2$, and the sulphonic acids of these compounds are produced by reducing the para azo derivatives of the arylsulphonyl-naphthylamines or arylene disulphonyl-bis-naphthylamines or their sulphonic acids containing the sulphonic radical in the positions 2, 6, 7, or 8 with respect to the arylsulphonyl-amino or arylene-disulphonyl-amino radical, by means of a reducing agent such as zinc dust and caustic soda, zinc dust and ammonium chloride, iron borings and dilute acids, alkaline sodium hydrosulphite or sulphide, stannous chloride or titanous chloride. Hydrolytic change does not take place with these reducing agents. The formation of the para azo derivatives is described.

160,857. UREA OR AMMONIA FROM CYANAMIDE, PRODUCTION OF. S. Giertsen, Odda, Norway. Application date, August 14, 1919.

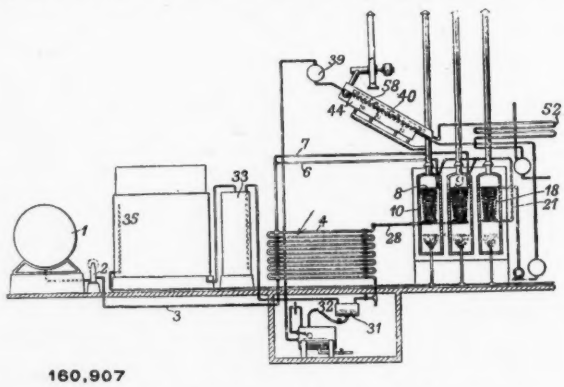
Cyanamide is saturated with water and sulphur dioxide, and heated at a pressure of 5-20 atmospheres and a temperature of 80°-90°C., when a quantitative transformation of the cyanamide into urea takes place. If higher temperature, pressure and concentration of the sulphurous acid is employed, the urea is decomposed and ammonia is produced. The urea may be used as a fertiliser without removal of the impurities. The process is accelerated by the use of catalysts such as iron oxide or hydroxide, manganese oxide or hydroxide, or tin oxide or hydroxide. If calcium cyanamide is used with an excess of sulphur dioxide, soluble calcium bisulphite is obtained as a by-product, and may be converted into calcium sulphite by heating, or neutralising with lime. The residue consists mainly of graphite.

160,892. SAPONACEOUS COMPOSITIONS, MANUFACTURE OF. F. G. Chadbourne, 30, Moorgate Street, London. Application date, December 1, 1919.

Fatty acids are melted and incorporated by a rotary mixer with finely divided hydrated aluminium silicate or a natural substance containing it, such as china clay. The necessary amount of alkali is then added and the mixing continued till soap formation is completed. The soap may contain 20-50 per cent. of aluminium silicate. The process requires less time than usual, and milling is eliminated.

160,907. CONVERTING LIQUID HYDROCARBONS INTO HYDROCARBONS OF LOWER BOILING POINT, PROCESS OF. W. M. McComb, 51, E. 42nd Street, New York. Application date, December 24, 1919.

High boiling-point hydrocarbon oil having a Sp. gr. of 0·795 to 0·9 is pumped from a reservoir 1 by a pump 2 through a pipe 3 to a preheating apparatus 4, consisting of concentric pipes, where it is heated to a point slightly above its initial



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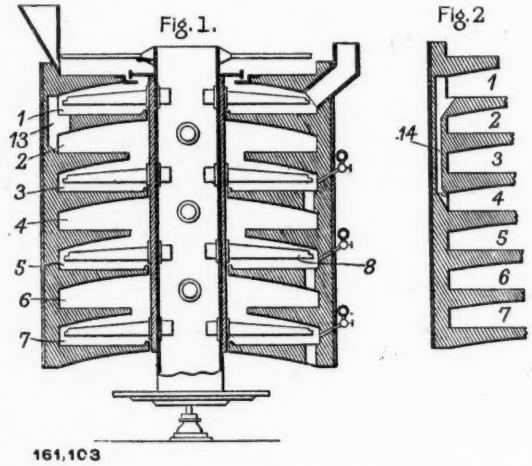
boiling point. The oil then passes through pipes 6, 7 to two tubular heaters, 8, 9, arranged in furnaces 10, the coils 8, 9 being more widely spaced towards the bottom. Water is forced through a similar coil 18, so that steam is delivered through the pipe 21 to the coils 8, 9, where it mixes with the oil. The oil and steam pass over a material such as nickel powder arranged in the lower part of the coils 8, 9, and is delivered through a smaller tube 28 to the preheater condenser 4. The vapour passes through a pipe 32 to a scrubber 33 and tank 35. The liquid from the vessel 31 passes to a tank 39, and thence to an inclined ribbed platform 40, which is heated by combustion products from the furnace 10, which are delivered to compartments in a vessel 44. The temperatures of these compartments are regulated so that they increase downwards, varying from 90°C. to 160°C. The vapour generated is withdrawn by a number of conduits 58, and condensed in a condenser 52.

161,103. TREATING SOLID SUBSTANCES CAPABLE OF REACTION WITH A GASEOUS REAGENT, PROCESS OF. E. C. R. Marks, London. (From Ore Roasting Development Co., 840, Widener Building, Philadelphia, Pa., U.S.A.) Application date, July 6, 1920.

The process is more particularly for effecting such exothermic reactions as the roasting of zinc blende in a furnace of the multiple hearth type, and the object is to maintain a substantially uniform temperature throughout the furnace. The furnace consists of a number of superposed hearths, 1 to 7, which communicate with one another by openings 13, alternately at the circumference and the centre. Each hearth is provided with a revolving stirring arm 8, to transfer the charge to the hearth next below, so that it is progressively fed downwards through the furnace. In addition to these communicating openings, by-pass channels 14 are provided, leading

directly from the first to the fourth hearth, and from the first to the sixth, so that only a portion of the charge progresses regularly through the furnace, the remainder being by-passed to lower hearths. Air or other gaseous reagents, such as sul-



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phur dioxide is supplied by pipes 16, 17, 18 to the hearths next below those which receive the ore either directly or through the by-pass channels. The air is regulated so that a uniform temperature is obtained on all the hearths.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 137,288 (J. A. Thibault), relating to conversion of lead into oxides, see Vol. II., p. 287; 139,172 (L. H. Diehl), relating to obtaining sulphur dioxide from blast furnace slag, see Vol. II., p. 479; 144,266 (Schweizerische Sodafabrik), relating to production of caustic soda or soda lye, see Vol. III., p. 188; 156,080 (Dr. A. Wacker Ges. für Elektrochemische Industrie), relating to dichlorethylene, see Vol. IV., p. 313.

International Specifications not yet Accepted

158,875. DISTILLING COAL-TAR, &c. C. Ab-der-Halden, Nomexy, Vosges, France. International Convention date, February 9, 1920.

Coal tar, pitch or crude oil, is heated in a still surmounted by a column, and steam is injected into the material. The vapour passes from the top of the column to a condenser into which steam may be injected to regulate the composition of the heavy fraction condensed. The vapour then passes to a tubular condenser, through which the raw material passes to pre-heat it before admission to the still, and lighter fractions are condensed. The remaining vapour then passes through a reflux condenser and an ordinary condenser, in which the lightest fractions are condensed.

158,887. NICKEL-COPPER MATTE, TREATING. G. Haglund, Falun, Sweden. International Convention date, February 10, 1920.

The matte is converted until the greater part of the nickel is reduced to metal and a portion of the matte is treated with acid in presence of air. Another portion of the matte is added to precipitate copper from the solution, and the nickel recovered from the remaining solution. The residues from the dissolving and cementation processes are roasted and the copper and nickel oxides leached with acid. The undissolved oxides are treated for the recovery of precious metals.

158,906. ETHYL ALCOHOL. Badische Anilin & Soda-Fabrik, Ludwigshafen-on-Rhine, Germany. International Convention date, February 9, 1920.

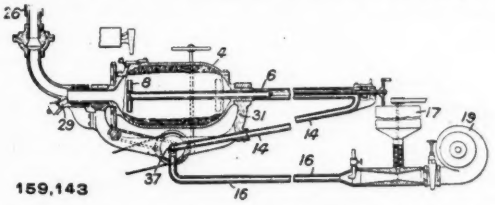
A mixture of acetaldehyde vapour and hydrogen is passed over a finely divided copper catalyst to produce ethyl alcohol. To prepare the catalyst, a hot solution of a copper salt is mixed with caustic alkali and the precipitated cupric hydroxide mixed with pumice stone and then reduced with hydrogen at 200°C.

159,135. SILVER AND LEAD CHLORIDES. Amalgamated Zinc (de Bavay's), Ltd., 360, Collins Street, Melbourne. International Convention date, February 13, 1920.

Sulphide ores, concentrates, slimes, &c., containing lead, silver and zinc are treated at 450°C. to 600°C. in a closed furnace or retort in the absence of air, with a chloridising gas. The ore is rabbled, or the gas is passed through layers of it, or the ore is allowed to fall through the gas, in order to secure intimate contact. Under these conditions only the lead and silver are attacked, and are leached out either separately or together. Hydrochloric acid gas may be used as the chloridising agent.

159,143. TREATING ORES. Trent Process Corporation, 1440, U Street, Washington, D.C., U.S.A. (Assignees of W. E. Trent, 908, G. Street, Washington, D.C., U.S.A.) International Convention date, February 21, 1920.

Ore or slime is finely divided, mixed with flux and fuel, and fed from a hopper 17 into an air current supplied by a blower 19. The mixture passes through pipes 16, 14, 6, to a distributor 8, which projects it against the inner walls of a rotating furnace 4. The distributor 8 and the pipe 6 are

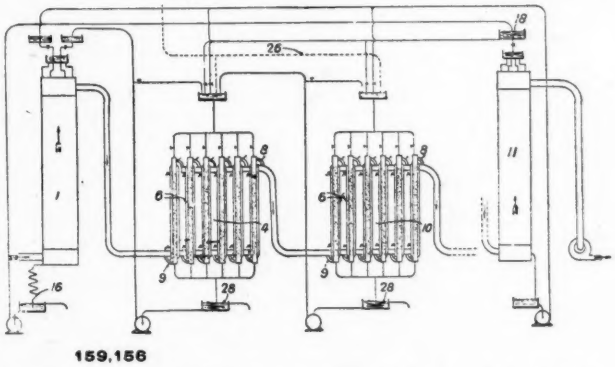


159,143

traversed longitudinally, so that a deposit of sintered ore is formed on the wall of the furnace. The deposit may be smelted by continuing the operation with a supply of air or air and fuel only from the distributor 8. An oxidising, neutral, or reducing gas may be supplied to the furnace during the operation. The products may be discharged through an opening 29 by tilting the furnace about an axis 37. The process is applicable for the treatment of iron oxide, or iron-zinc sulphide ores.

159,156. SULPHURIC ACID CHAMBERS. M. H. Kaltenbach, 73, Boulevard de Montmorency, Paris. International Convention date, February 17, 1920.

The usual lead chambers are dispensed with. Hot gas passes from the Glover tower 1 through a series of tubes 4, 10, packed with filling materials and surrounded by water jackets through which a regulated current of water flows to control the temperature of the reaction. Further regulation



159,156

is effected by controlling the temperature of the irrigating acid by coils 16, 28. This acid is obtained from the next series of tubes or from the Glover tower or Gay-Lussac tower 11. The Glover tower is supplied with acid from the Gay-Lussac tower, and the acid taken from it is partly returned to the tank 18 and partly withdrawn from the system.

159,164. SYNTHETIC RESINS. Condensite Co. of America, Bloomfield Avenue, Bloomfield, N.J., U.S.A. (Assignees of D. S. Kendall, 90, Hillside Avenue, Glen Ridge, N.J., U.S.A.) International Convention date, February 19, 1920.

Phenol or its homologues are heated with acetaldehyde or

paraldehyde and an acid condensing agent such as hydrochloric or sulphuric acid. Steam is subsequently blown through to remove hydrochloric acid, or an alkaline earth carbonate may be added to neutralise sulphuric acid. The product is a soluble fusible resin which may be treated with formaldehyde or hexamethylenetetramine to render it hard and infusible.

159,193-4. AMMONIA FROM PEAT. P. Brat, 112, Haupstrasse, Oldenburg, Germany. International Convention date, February 18, 1920.

159,193. Peat is mixed with an alkaline reagent and treated in an autoclave at 170°C. to 200°C. and a pressure of 6 atmospheres to produce ammonia as described in 157,745-6 (See THE CHEMICAL AGE, Vol. IV., p. 455) and in 159,194 (below). The residue containing salts of water-soluble acids is subjected to pressure, osmosis, or lixiviation, and salts of other metals are obtained by double decomposition.

159,194. In the process described in 157,745-6, the heating may be continued to 200°C. to 700°C., when the hydrocarbons are obtained without adding a hydrocarbon of high boiling point. If pitch is added, the hydrocarbons are obtained by heating the mixture to 500°C.

159,201. CALCIUM CARBIDE. L. P. Basset, 54, Avenue Marceau, Paris. International Convention date, February 20, 1920. Addition to 140,096.

A mixture of lime or limestone, coal, and flux are charged into a rotary furnace, and hot air and finely pulverised coal or atomised hydrocarbon oil are injected into the lower end. Calcium carbide is formed and the process is continuous. The proportions of fuel and air are adjusted so that the fuel is burned to carbon monoxide, and this gas is subsequently burned to heat the air supply.

159,202. ALKALI AND ALKALINE EARTH SULPHIDES. L. P. Basset, 54, Avenue Marceau, Paris. International Convention date, February 20, 1920.

The process described in 159,201 is applied to the reduction of sulphates of the alkali and alkaline earth metals to their sulphides. Steam may be admitted with the air so that water gas is formed, and is subsequently withdrawn to be used for heating the air supply.

Specifications Accepted, with Date of Application

117,085. Alkali percarbonates, Manufacture of. Deutsche Gold- und-Silber Scheide-Anstalt vorm. Roessler. June 25, 1917.

133,712-3. Resin-like bodies, Production of. M. Melamid. February 4, 1918.

140,387. Rubber, Process for the vulcanisation of. G. Bruni. March 15, 1919.

142,480. Sugar and Furfurol, Manufacture of—from wood and other cellulose-containing substances. A. Classen. March 18, 1919.

143,243. Cement, Manufacture of. K. G. Wennerstrom. February 10, 1919.

144,240. Solutions, Manufacture of concentrated. B. Junquera. May 30, 1919.

146,332. Separate recovery of constituents of the distillations of gas from fuel, Process for. F. Bergius and P. Kalnin. October 26, 1917.

146,865. Glycerine, Process for purifying. Elektro-Osmose Akt.-Ges. (*Graf Schwerin Ges.*) January 17, 1919.

147,583. Coal gas, Method of purifying—by means of ammonia. C. Still (firm of). December 10, 1917.

161,591. Butyl alcohol. Manufacture of secondary. C. Weizmann and D. A. Legg. February 24, 1916.

161,606. Aluminous compounds, Manufacture of. P. Spence & Sons, Ltd., H. Spence, and W. B. Llewellyn. October 11, 1919.

161,608. Retorts for the distillation of carbonaceous substances. Low Temperature Carbonisation, Ltd., T. M. Davidson and H. L. Armstrong. October 14, 1919.

161,654. Iron and tin from tin scrap, Method of obtaining. P. A. Mackay. January 9, 1920.

161,655. Strontium and barium sulphates, Method of obtaining—from their native sulphates. P. A. Mackay. January 9, 1920.

161,656. Copper sulphate direct from metallic copper, Process of obtaining. P. A. Mackay. January 9, 1920.

161,679. Oxyaldehydes and their derivatives, Process for the manufacture of. G. B. Ellis. (*Soc. Chimique des Usines du Rhone, anciennement Gilliard, P. Monet, et Cartier.*) January 13, 1920.

161,777. Fertiliser and process for making same. E. H. Sams. February 17, 1920.

161,859. Naphthylamine sulphonic acids, Manufacture of. South Metropolitan Gas Co., and H. Stanier. May 25, 1920.

Applications for Patents

Amend, O. P. Refining petroleum distillates. 12461. April 30.

Ashcroft, E. A. Precipitating precious metals from cyanide solutions. 12347. April 29.

Boorman, H. G. T. Treatment of nitrates for fertilisers, &c. 12157. April 27.

Brightmore, J. Fixation of atmospheric nitrogen. 12146. April 27.

Browning, R. G. Treatment of nitrates for fertilisers, &c. 12157. April 27.

Burgess, L. Process of reducing aluminium oxide. 12129. April 27.

Commin, F. J. Treatment of pitch. 12388. April 29.

Crossthwaite, W. J. Synthetic resin varnish. 12442. April 30.

Davidson, S. C. Preparation of preservative substances for rubber latex. 12343. April 29.

Dreyfus, H. Manufacture of cellulose derivatives. 11854. April 25.

Kenyon, G. L. T. Separating or grading powdered or granular materials, and treatment thereof by gases, &c. 11860. April 25.

Koppers, H. Process of desulphurising large masses of iron and steel. 12244. April 28. (Germany, April 28, 1920.)

Leon, M. Dyeing aluminium. 12413. April 30.

Lister, W. N. Dyeing aluminium. 12413. April 30.

Parrish, P. Manufacture of neutral sulphate of ammonia. 12116. April 27.

Plauson's (Parent Co.), Ltd. (Plauson). Process for manufacture of cellulose compounds. 12190. April 28.

Raisin, V. Process for producing boron. 11947. April 26. (France, April 30, 1920.)

Sharples Separator Co. Centrifugal emulsifiers. 12048. April 27.

Soc. Anon. Usines Métallurgiques de la Basse-Loire. Process for production of basic steel. 12260. April 28. (France, May 18, 1920.)

South Metropolitan Gas Co. Manufacture of neutral sulphate of ammonia. 12116. April 27.

Vautin, C. T. J. Process for separation of nitro-aromatic compounds from explosives, &c. 12458. April 30.

Patents Court Cases

THE following patents have been indorsed "Licences of Right" under Section 24 of the Patents and Designs Acts, 1907 and 1919:—19,792/1914 (concentration of nitric acid), 124,191 (pure concentrated nitric acid and tetroxide of nitrogen), 126,951 (metallurgical reduction processes), 129,974 (ammonium nitrate fertilisers), 132,496 (fertilisers containing nitrogen and phosphoric acid), 134,207 (crystallisation from solutions). These are in the name of Norsk Hydro-Elektrisk Kvaelstofaktieselskab.

Annual Meeting of the Royal Institution

AT the annual meeting of the members of the Royal Institution held on May 2, Sir James Crichton-Browne, in the chair, the report of the visitors for the year 1920, testifying to the continued prosperity and efficient management of the Institution, was read. The number of new members elected during the year was 54, a slight decrease on the previous year. Sixty-three day lectures and 19 evening discourses were delivered, and the books and pamphlets presented to the library amounted to 163, and the number purchased by the managers 465, making a total of 628 volumes added to the library during the year. Thanks were voted to the President, Treasurer and Secretary, to the Committees of Managers and Visitors, and the Professors, for their valuable services during the past year.

The following were unanimously elected as officers for the ensuing year:—President, The Duke of Northumberland; Treasurer, Sir James Crichton Browne; Secretary, Colonel E. H. Grove-Hills; Managers, The Rt. Hon. Lord Blyth, Horace T. Brown, J. H. Balfour Browne, John M. Bruce, Sir James J. Dobbie, Percy F. Frankland, Alexander H. Goschen, The Rt. Hon. Earl Iveagh, H. R. Kempe, Sir Ernest Moon, Alfred W. Porter, Sir James Reid, Bart., Sir David Salomons, Bart., Sir Alfred Yarrow, Bart., The Rt. Hon. Sir Robert Younger. Visitors:—James H. Batty, Alfred Carpmael, Frank Clowes, Edward Dent, Lieut.-Col. Henry E. Gaulter, George H. Griffin, W. E. Lawson Johnston, John R. Leeson, F. K. McClean, Edward M. Nicholls, Hugh M. Ross, Joseph Shaw, Sidney Skinner, Thomas H. Sowerby, William Stone.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, MAY 5.

Business during the past week has been purely of the hand-to-mouth variety and, generally speaking, there is a complete absence of demand, which becomes more and more apparent as the coal strike continues.

There is a certain export inquiry, but very little business matures.

General Chemicals

ACETONE is in constant inquiry and stocks are small.

ACID ACETIC maintains its firmer tendency, but the demand is very limited.

ACID CITRIC remains unchanged.

ACID FORMIC has a small consumptive demand; prices unaltered.

ACID OXALIC is only in limited demand, but the firmer tendency has been maintained.

ACID TARTARIC.—The market is still controlled by realisation offers. Little business is reported.

BLEACHING POWDER is in poor demand. Price nominally unchanged.

COPPER SULPHATE is slow of sale, but the advance in the value of foreign currencies may help matters before long.

FORMALDEHYDE is in steady inquiry for spot delivery and the price is inclined to be a little firmer.

LEAD ACETATE remains featureless.

POTASH BICHROMATE still exhibits an easy tendency, with little doing.

POTASH CAUSTIC.—A few small orders are reported, but no business of importance.

SODA ACETATE remains unchanged.

SODA BICHROMATE is still pressed for sale, and the second-hand price does not seem to be justified by intrinsic value.

SODA CAUSTIC.—Nothing doing.

SODA HYPOSULPHITE.—This article appears to have found its level, but business is only of small proportions.

SODA NITRATE.—There is practically no inquiry, but stocks are in firm hands.

SODA PRUSSIATE.—The reduced price does not seem to have stimulated the demand. Export orders are in the market, but the limits are too low.

Coal Tar Intermediates

There is no change to report in this section, the market being still under the influence of the coal strike.

ALPHA NAPHTHYLAMINE is in moderate request, and without change in price.

ALPHA NAPHTHOL is inquired for on export account, but little actual business is reported.

BETA-NAPHTHOL is in very small request and prices are inclined to be easy.

DINITROCHLORBENZOL continues in request and the price is firmer.

NITROBENZOL is in steady demand and price is inclined to be firmer.

PARANITRANILINE.—Stocks are passing steadily into consumption, and there is no change to report in the price.

SALICYLIC ACID continues in request.

Coal Tar Products

The demand for coal tar products continues to be poor, although the diminution of stocks, consequent on the restriction of supplies owing to the coal strike, is slowly having its effect, and one or two of the undernoted articles show a firmer tendency, although no rise in price has yet been recorded.

90's BENZOL remains inactive at 2s. 10d. in the North and 3s. in the South.

PURE BENZOL is quoted at 3s. in the North and 3s. 2d. in the South.

CREOSOTE OIL is worth from 7¼d. to 8d. per gallon in the North, while in the South the price is in the region of 9d.

CRESYLIC ACID is very flat.

SOLVENT NAPHTHA.—Although the demand is poor, supplies for prompt delivery are becoming more scarce, and solvent is to-day worth 2s. on rails.

HEAVY NAPHTHA is quoted from 2s. 2d. to 2s. 3d. on rails.

NAPHTHALENE is inactive, the price for crude remains from £8 to £12, while refined is worth from £18 to £23.

PITCH.—There is an improved demand for prompt delivery, and the market is somewhat firmer. To-day's quotations are approximately 60s. to 62s. 6d. f.o.b. East Coast, and 65s. to 70s. f.o.b. London.

SULPHATE OF AMMONIA—There are no new features to report.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	95	0	0	to	100	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst	ton	69	0	0	to	70	0	0
Carbolic, cryst. 39-40%	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	2	6	to	0	2	8
Formic, 80%	ton	80	0	0	to	85	0	0
Gallic, pure	lb.	0	4	3	to	0	4	6
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	42	10	0	to	45	0	0
Nitric, 80 Tw	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	0	10	to	0	0	11
Phosphoric, l.5	ton	55	0	0	to	57	0	0
Pyrogallic, cryst	lb.	0	8	0	to	0	8	3
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Salicylic, B.P.	lb.	0	1	6	to	0	1	9
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	9	to	0	1	10
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	65	0	0	to	70	0	0
Ammonia, muriate (galvanisers)	ton	55	0	0	to	57	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	420	0	0	to	425	0	3
Arsenic, white, powdered	ton	55	0	0	to	60	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	20	0	0	to	21	0	0
Borax crystals	ton	34	0	0	to	36	0	0
Calcium acetate, Brown	ton	12	0	0	to	13	0	0
,, Grey	ton	19	0	0	to	21	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	35	0	0	to	37	0	0

	per	£	s.	d.		£	s.	d.
Cream Tartar, 98-100%	ton	140	0	0	to	150	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	120	0	0	to	122	10	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts, commercial	ton	6	0	0	to	7	0	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	50	0	0	to	52	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	55	0	0	to	57	0	0
Litharge	ton	38	10	0	to	40	0	0
Lithopone, 30%	ton	30	0	0	to	32	10	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	10	10	0	to	11	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	75	0	0	to	78	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	ton	145	0	0	to	150	0	0
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	*ton*	*48*	*0*	*0*	*to*	*50*	*0*	*0*
Potassium bichromate	lb.	0	0	9½	to		—	
Carbonate, 90%	ton	55	0	0	to	60	0	0
Chloride	ton	38	0	0	to	40	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	200	0	0	to	210	0	0
Nitrate, refined	ton	50	0	0	to	52	0	0
Permanganate	lb.	0	2	0	to	0	2	3
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow.	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt	3	15	0	to		—	
Seconds	cwt	3	10	0	to		—	
Sodium acetate	ton	35	0	0	to	37	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	7½	to	0	0	8
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	22	0	0	to	24	0	0
Nitrite, 96-98%	ton	50	0	0	to	52	0	0
Phosphate, crystal	ton	25	0	0	to	27	0	0
Perborate	lb.	0	1	9	to	0	2	0
Prussiate	lb.	0	0	8	to	0	0	8½
Sodium Sulphide, crystals	ton	20	0	0	to	23	0	0
Sulphide, solid, 60-62%	ton	40	0	0	to	41	0	0
Sulphite, cryst.	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	3	to	0	2	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	1	8	to	0	1	9
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	0	to	0	3	3
Aniline oil, drums extra	lb.	0	1	7	to	0	1	8
Aniline salts	lb.	0	1	8	to	0	1	10
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	4	9	to	0	5	0
Benzidine, base	lb.	0	10	6	to	0	11	0
Benzidine, sulphate	lb.	0	9	6	to	0	10	0
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	8	0	to	0	8	6
Betanaphthol	lb.	0	2	9	to	0	3	0
Betanaphthylamine, technical	lb.	0	9	6	to	0	10	0

	per	£	s.	d.		£	s.	d.
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	0	to	0	5	3
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	0
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthalene	lb.	0	1	5	to	0	1	6
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	0	to	0	1	2
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	3	to	0	4	6
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	7	6	to	0	8	0
Phthalic anhydride	lb.	0	4	9	to	0	5	6
Resorcin, technical	lb.	0	7	6	to	0	8	0
Resorcin, pure	lb.	0	8	9	to	0	9	0
Salol	lb.	0	3	6	to	0	3	9
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Cardiff By-Products

CARDIFF, WEDNESDAY.

Sulphate of Ammonia—	
For home consumption (per ton o.t.)	£24 11s.
For export (per ton f.o.b.)	£20 to £30
National Benzole (per gallon)	3s. to 3s. 6d.
Motor Benzol (per gallon)	3s. to 3s. 5d.
Crude Benzol (per gallon)	1s. 9d. to 2s.
Solvent Naphtha (per gallon)	2s. 5d. to 2s. 7d.
Heavy Naphtha (per gallon)	2s. 9d. to 2s. 11d.
Crude Naphthalene Salts (per ton)	£9 to £15
Pitch (per ton)	80s. to 100s.
Creosote (per gallon)	10d. to 11d.

German Dyestuffs Combination

THE Berlin correspondent of the Exchange Telegraph Co. states that the lately-announced increase in the capitalisation of the aniline concern is now reported in detail. The seven chemical, dye and nitre companies composing this concern will convert part of their preference shares, issued last November, into ordinary shares, and offer the new ordinary shares to their shareholders, reducing the preferred shares outstanding from 297,660,000 marks to 142,320,000 marks. They will at the same time issue sufficient new ordinary shares to raise the total from 745,640,000 marks to 1,620,000,000. Including bonds, the capitalisation will be 1,915,220,000 marks, which is the largest capitalisation of any single German industrial combine.,

The companies are the Hoechster Dye Works, Badische Aniline, Friedrich Bayer, Treptow Griesheim, Weiler-ter-Mer, and Leopold Casella Companies. The dividends paid for 1920 were in all, except in two cases, 20 per cent. The completion of the combine's nitre works at Merseburg and Oppau, in which already 1,000,000,000 marks have been invested, will require, says the *Frankfurter Zeitung*, another 1,000,000,000 marks.

Referring to the SELLING PRICES OF FERTILISERS on Wednesday, Sir Archibald Mitchelson, chairman of the Anglo-Continental Guano Works, Ltd., said these would have to come down. It was impossible to forecast the course of trade in fertilisers in the second half of 1921.

Company News

ANGLO-CONTINENTAL GUANO WORKS.—The directors announce a dividend of 1½d. per share, less tax, on the ordinary shares for half-year, payable May 19, making 12½ per cent. for the year; £5,000 is placed to depreciation reserve, making £21,000; and £19,941 is carried forward. Last year dividend same; £4,834 to depreciation reserve; £17,767 forward. At the ordinary general meeting, held on Wednesday, the chairman (Sir Archibald Mitchelson) said that in a period of trade depression such as now existed it was gratifying to show a trading profit of nearly £61,000, making with the carry-over a disposal total of £78,534. This enabled the directors to recommend a final dividend at the rate of 12½ per cent. During the year they had acquired two more old-established concerns, each doing a fairly large trade under well-known brands. The directors' policy in regard to these fertiliser concerns was to acquire control through their share capital only, leaving them to carry on under their own several names as legal entities. As between all the companies, however, including themselves, there was substituted for the former competition a complete co-operation. But the most tangible advantage from a financial point of view was obtained by a system of distribution of combined products of all these works. Formerly, when all were in competition, fertilisers were railed quite long distances into each other's territory at a considerable cost of carriage. Now, under the scheme which was being gradually developed, the trade of the whole group in a given area would be supplied from the nearest works.

Women and Young Persons

Employment in Lead Processes

THE Home Secretary, under the Women and Young Persons (Employment in Lead Processes) Act, 1920, proposes to make Orders forbidding the employment of women and young persons in any process involving the use of lead compounds if dust or fume from a lead compound is produced in the process or the persons employed are liable to be splashed with a lead compound, unless the regulations set out in the Section are complied with. These regulations lay down that the persons employed must undergo the prescribed medical examination at the prescribed intervals, and the prescribed record must be kept with respect to their health; such suitable cloakroom, messroom and washing accommodation as may be prescribed shall be provided for the use of the persons employed.

One Order declares what is a lead compound for the purposes of the Act, *i.e.*, the expression "lead compound" shall mean any compound of lead other than galena which, when treated in the manner prescribed below, yields to an aqueous solution of hydrochloric acid, a quantity of a soluble lead compound exceeding, when calculated as lead monoxide, 5 per cent. of the dry weight of the portion taken for analysis.

"The method of treatment shall be as follows:—A weighed quantity of the material which has been dried at 100°C. and thoroughly mixed is to be continuously shaken for one hour, at the common temperature, with 1,000 times its weight of an aqueous solution of hydrochloric acid containing 0·25 per cent. by weight of hydrogen chloride. This solution is thereafter to be allowed to stand for one hour and then filtered. The lead salt contained in the clear filtrate is then to be precipitated as lead sulphide and weighed as lead sulphate."

Tenders for Sulphate of Alumina

The Commercial Secretary to H.M. Legation at Buenos Aires states that the local authorities are calling for tenders to be presented by June 7 for the supply of 4,000 tons of sulphate of alumina. Local representation by a resident agent is essential. The specification is being forwarded by mail and will be available for inspection by United Kingdom firms on or about May 26 on application at the Enquiry Room of the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Egypt ...	Oils and paints. Tenders to Egyptian War Department	—
Belgium ...	Chemicals; cement; varnishes; and paints.	571
Norway ...	Technical and edible oils	581
Belgrade ...	Drugs	583
Spain... ...	Chemicals, paints and varnishes...	586

Tariff Changes

CYPRUS.—Chemicals and drugs of all kinds may not now be exported from Cyprus to any destination. Explosives may only be exported to the United Kingdom, and British Possession and Protectorates.

NEW ZEALAND.—The export prohibitions on glue and gelatine and certain materials for the manufacture of glue and gelatine have been withdrawn.

CZECHO-SLOVAKIA.—H.M. Commercial Secretary at Prague has forwarded a copy of the list of goods which may at present be exported from Czecho-Slovakia without an export licence. The list, which appears to be of a provisional nature, may be seen at the Tariff Section of the Department of Overseas Trade, 18, Queen Anne's Gate, London, S.W. 1.

FRANCE.—The export duty of 1½ francs per 100 kilogs, on dephosphorisation slag exported or re-exported from France is now removed.

ITALY.—Until further notice import licences will not be required for goods of any kind (other than those which may only be imported on State account) imported into Italy by parcel post.

ROUMANIA.—The exportation of caustic soda, all mineral greases with a base of petroleum residues, paraffin wax, and crude petroleum (including debenzinised petroleum), is now prohibited. Cellulose cement and ferro-manganese may only be exported by special authorisation and after home requirements have been satisfied.

SWEDEN.—The prohibitions on the export of oilcake have been withdrawn.

TUNIS.—Celluloid (including artificial ivory and artificial tortoise-shell), crude, in lumps, unmanufactured plates or sheets, tubes, rods, sticks, chips and waste pieces intended for re-manufacture; and essence of turpentine, may now be exported from Tunis.

GREAT BRITAIN.—The Board of Trade (Licensing Section) announce that as from April 28, caustic potash and articles containing caustic potash; and potassium carbonate and mixtures containing potassium carbonate, are removed from the list of export prohibited goods.

British-Made Scientific Glassware

DUROGLASS, LTD., are sending out a list of their standard graduated glassware to the chief users throughout the country. The aim, they state, is to produce accurate apparatus, with a table of errors, and to charge a reasonable price. All glassware is now supplied with a certificate, guaranteeing accuracy and giving a table of errors.

Every certified article is marked with the word "DURO," and in addition "A.1," for easy identification in the laboratory, together with a distinctive reference number, which is also on the certificate. The firm guarantee to replace, free of all charge, any of their certified articles which are proved to be inaccurate within the terms of the certificate.

Speaking at an exhibition of the work of disabled soldiers on Monday Dr. Macnamara said that from the close of this month all firms tendering for GOVERNMENT CONTRACTS, to whom the conditions of membership of the King's Roll were applicable, would, unless under exceptional circumstances, require to be on the roll or they would not get the contracts.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

GODDON, G. A. and COKE, S. R., manufacturing chemists, 49, Lamb's Conduit Street, London, W.C. 1, under the style of Goddon & Coke, by mutual consent as from April 30, 1921. All debts received or paid by S. R. Coke at 11, John Penn Street, Lewisham, S.E.13. The business will be continued by G. A. Goddon at 49, Lamb's Conduit Street, W.C. and by S. R. Coke at 11, John Penn Street, Lewisham.

Liquidator's Notice

AFLECTITE CELLULOID SYNDICATE, LTD.—A general meeting of members will be held at 3, Frederick's Place, Old Jewry, London, E.C., on Monday, June 6, at noon. N. E. Waterhouse, Liquidator.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

DONCASTER GLASS CO., LTD.—Reg. April 23, mortgage to National Provincial & Union Bank of England, Ltd., securing all moneys due or to become due to the Bank; charged on glass works, factory, &c., at Doncaster.

MOND NICKEL CO., LTD., London, S.W.—Reg. April 21, £1,300,000 debenture stock secured by Trust Deed dated April 1, 1921; charged on various lands, buildings, &c. at Clydach & Birmingham, also general charge. *£875,000 August 11, 1920.

ROGER & GALLETT (London), LTD., London, W.—Reg. April 2, £4,500 charge under Land Transfer Acts, to Parfumerie Roger & Gallet Société Anonyme, 38, Rue de Hauteville, Paris; charged on 14, Poland Street, W.

NATIONAL PAPER AND PULP CO. (1920), LTD., London, S.W. Reg. April 21 (by order on terms) £200,000 charge under Land Transfer Acts, to Royal Exchange Assurance Corporation, Royal Exchange, E.C.; charged on 66, Upper Thames Street, E.C.

NORTHFLEET PORTLAND CEMENT CO. (1917), LTD., London, E.C.—Reg. April 19, £1,500 1st debenture, to W. E. Taylor, 125, Ravensdale Road, Stamford Hill, merchant's manager; general charge. *£9,700. February 21, 1919.

THERMOGENE CO., LTD., Haywards Heath.—Reg. April 19, £20,000 debentures; general charge. *——. March 26, 1920.

TURNER DRUG AND CHEMICAL CO., LTD., Ilford.—Reg. April 19, £7,000 mortgage, to Mrs. B. Fogden, Prestatyn, Southend-on-Sea and another; also reg. April 19 debs. for same amount as collateral security to above; charged on land, buildings, &c., at Ilford; also general charges.

Satisfaction

NATIONAL GLASS CO., LTD., London, E.C.—Satisfaction reg. April 26, all moneys not ex. £1,000, reg. February 9, 1921.

Bills of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of* 1882 *and under the Act of* 1878. *Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

CLARK, G., 8, Hurst Street, Moses Gate, Bolton, chemical worker. Filed May 2. £30.

FORSE, L., Silchester, Grove Avenue, Yeovil, chemist. Filed April 27. £100.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of Count Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

DIXON (WILLIAM B.),, LTD., 17, Lord Street, Stockport, chemists. £10 4s. 4d. March 16.

NEILSON, E., 5, Kedleston Road, Derby, chemist. £24 16s. 4d. March 18.

SIMMONDS, W., 58, Stephens Road, West Ham, Essex, chemist. £11 1s. 1d. March 15.

MATHEW & SHAW, Cowhill Lane, Ashton-under-Lyne, manufacturing chemists. £44 7s. 4d. March 17.

REINECKES (a firm), 6, Freeman Street, Grimsby, druggists. 23 4s. 8d. March 17.

ANGLO-COLONIAL DYES, LTD., 681, Salisbury House, E.C., dye merchants. £20 8s. 6d. March 11.

CLEGG —, 168, Askew Road, Shepherd's Bush, Middlesex, chemist. £11 7s. 7d. March 14.

DAVIES, O. T., 5, The Broadway, St. Margarets, Middlesex, chemist. £15 9s. 1d. March 16.

EDWARDS, J. M., 311, Fulham Palace Road, S.W., chemist. £21 7s. 4d. March 17.

NOBLES DRUG STORES, LTD., R/O., Cable Street, Stepney Middlesex, chemists. £23 3s. 6d. March 21.

SUMMERS CARBONIZING SYNDICATE, LTD., 28, Threadneedle Street, E.C., coal carbonizers. £18 11s. 4d. March 16.

ALLKINS, W. H., 1, Exchange Buildings, Coulsdon, Surrey, chemist. £10 10s. 0d. March 16.

BEVAN, M. L., Morriston, Swansea, chemist. £15 15s. 10d. March 23.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 *and* 117, *Chancery Lane, London, W.C.*2. :—

B. & S. H. THOMPSON & CO., LTD., 18 & 19, Gresham House, Old Broad Street, London, E.C.2 (incorporated in Quebec), importers and dealers in chemical and general merchandise, &c. Nominal capital 250,000 dollars in 2,500 shares of 100 dollars each. Person authorised to accept service: Tate MacEwan Robertson, 18 & 19, Gresham House, Old Broad Street, E.C.2.

GLOBE DRUG CO., LTD., 18, Blackburn Road, Accrington, Lancaster. Wholesale chemists. Nominal capital £2,000 in 2,000 shares of £1 each. Directors: A. J. Espley, 64, Higher Antley Street, Accrington (Gov. Dir.), S. J. E. Bourn, 95, Conway Street, Birkenhead, Chester. Qualification of directors: one share.

NETTOLENE CHEMICAL CO., LTD., 49, Brownlow Road, Willesden, N.W. Chemical manufacturers. Nominal capital £15,000 in 15,000 shares of £1 each. Directors: J. H. Johnson, 55, Jevington Gardens, Eastbourne, Henrietta M. Johnson, 55, Jevington Gardens, Eastbourne, J. Jackson, 13, Leach Street, Rochdale.

CARBIDE CORPORATION, LTD., wholesale and retail dealers in calcium carbide. Nominal capital £20,000 in 19,000 preference shares of £1 each and 20,000 ordinary shares of 1s. each. Directors: J. O. L. Johnson, 52, Seymour Street, W. (Chairman), H. B. Logan, 53, Avonmore Road, W.14, G. A. Saville, 10, St. Colme Street, Edinburgh, A. D. Cameron, 185, Buchanan Street, Glasgow, S. H. Biscoe, Berners Hotel, Berners Street, W. Qualification of directors: 1 share.

BAKU-LONDON OIL CO., LTD., 110, Cannon Street, E.C.4. To carry on all kinds of exploration business, and acquire lands bearing oil or other mineral substances and turn same to account. Nominal capital £100,000 in 100,000 shares of £1 each. Directors: to be appointed by subscribers. Subs.: W. M. Casalet, Fairlawne, Tonbridge, Kent, N. Honatamoff, Russell Hotel, Russell Square, W.C.